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Independent User Group

Monitor

130XE Review plus RAMDISK program

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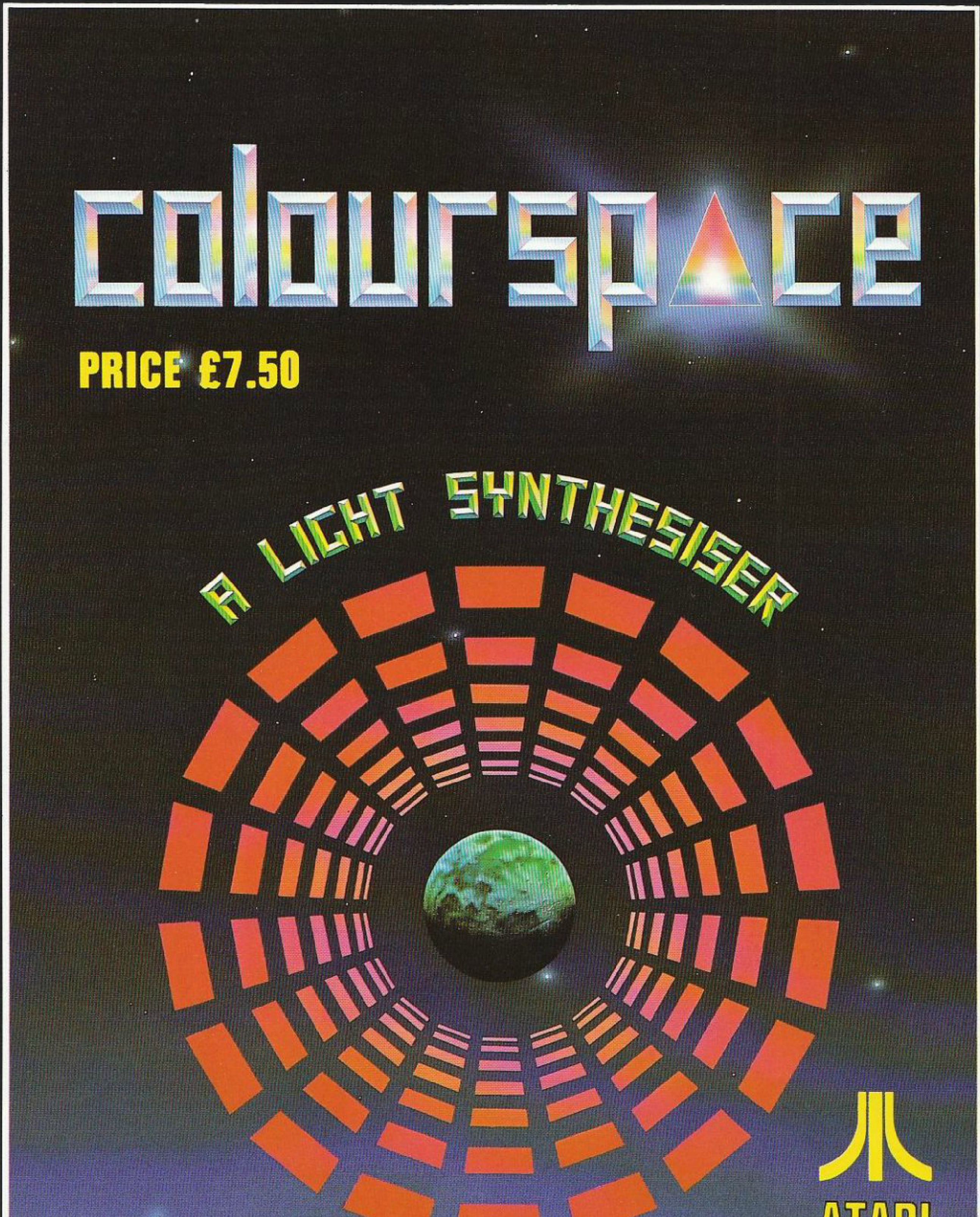
Fast Fill Routine
KEYO typing checker
Binary loads from Basic

HAPPY TYPER
Reviewed: TopDOS and Homeword
Profile on Lea Valley Club
Go FORTH



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EXCITING TIMES!

Things are really moving on the Atari front these days. Since the new machines were announced all the national magazines have reviewed the 130XE and raved over the 520ST. It's as if they have suddenly realised what they have missed, if only they had asked us we could have told them years ago. I just feel sorry for all those people who have bought inferior products. At first they were sceptical that the new machines even existed, but now that the 130XE and the 520ST (in limited numbers at present) are here, they are getting more and more interested. Lets hope they continue as they have started and support the machines as much as they deserve.

It is reported that over one hundred development systems have been sold in the U.K. and that many well known software houses are busy developing (converting?) programs for the 520ST. Having the good fortune to see a 520ST system for myself recently, I can report that it lived up to all my expectations. GEM was very impressive, the mouse was easy to operate, the drives were fast and silent, the monitor was sharp and clear, the keyboard was finger sensitive and a joy to type on. If the 520ST package consisting of a computer terminal, monochrome monitor, 3 1/2 inch disk drive, a mouse, GEM, BOS (business operating system), TOS, GEMpaint and GEMwrite, at £749 is not an all time winner, then I don't know what will be!

Atari DOS 2.5 is now being passed around. It contains extra files (not part of the DOS) to convert DOS 3 files to DOS 2.5 or DOS 2 format, unerase files, create an AUTORUN.SYS, verify disks and change drive numbers. Another file on the disk gives a RAMDISK for use with the 130XE. A mini-manual is also supplied (supplied as a file on the U.K. version) which gives details on how to operate DOS 2.5, note that a full blown manual will be available latter probably costing around £14.

Atari User magazine is now well under way, and Database has thanked the club for passing on the names and addresses of all the people who wished to subscribe.

Most of you have returned your membership questionaire and we are in the process of compiling the results. We wish to thank you all for your comments and we have already acted on some of the points raised. In this issue is our own typing checker program called KEYO which we think is a bit better than some others which are around at the moment. Also from this issue on you will be able to purchase a disk with all of the main programs on.

Finally, there are rumours that the next machine to be launched here will be the 256K model in the ST range, the 260STD (with built in disk drive), it will be interesting to see if this is true. One last point, we would like to credit some of the pictures in the 'Power without the Price' article in issue 8 to Analog magazine, our thanks to Michael J. Deschenes for writing to us to inform us of our omission.

CREDITS

Editor	Roy Smith
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Technical Editor	Keith Mayhew
Adventure Editor	Steve Hillen

CONTENTS

Due to lack of space Part 2 of Opening Out has been omitted.

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COVER: Photographs of the 520ST and the 130XE supplied by Silica Shop Ltd.
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130XE EXPLORED!

by Ron Levy

Welcome to this review of the first of Jack Tramiels new micro's – The 130XE.

The 130XE is, in essence, an 800XL (which was just a re–packaging of the trusty old 800/400 machines) but with a few layout changes and a VERY exciting addition in the form of an extra 64K of RAM!

The operating system and BASIC programming language of the 130XE is identical to the XL series so in this review, bearing in mind that the vast majority of our readers are already Atari computer owners, I shall restrict my comments to the features which make the 130XE unique within the Atari range. These are:

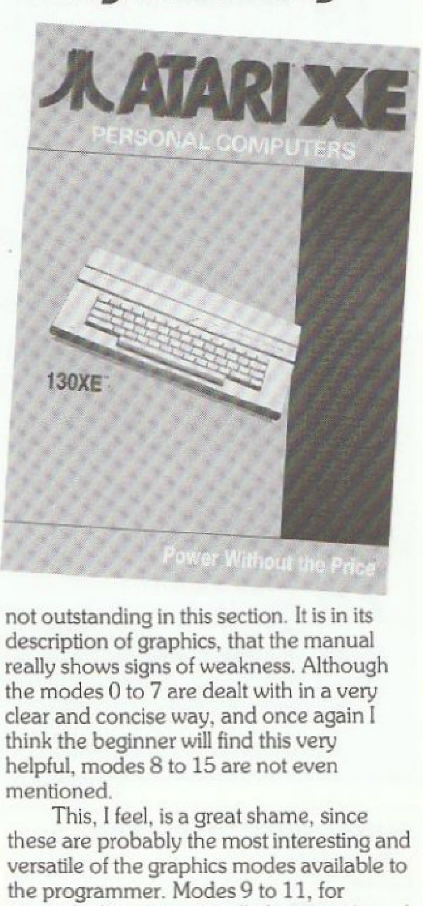
a) The Manual
b) The Physical Layout
c) The Extra 64K of Memory

THE MANUAL

Sadly, the manuals previously supplied with Atari computers have been shamefully inadequate. If you have bought an 800XL or 600XL you will have discovered that although you are given a nice glossy 61 page booklet, only four pages (7 sides) are of any actual relevance. The rest of the book is merely a set of the same 4 pages translated into five other languages! This is hopeless even for an experienced programmer. The novice doesn't stand a chance!

The new Atari regime, however has come to realise that a good machine is useless without a good manual, and that the vast majority of home computer buyers are novices. Thankfully the 130XE is supplied with a neat (8.5 * 5.5 inches) spiral bound handbook, an incredible 132 pages long and all in ENGLISH! At least one third of the manual is dedicated to teaching the elementary aspects of programming in BASIC to the absolute novice, and this it does very well indeed. It starts by showing how to print simple words to the screen and progresses at a gentle but thorough pace through to FOR/NEXT loops, mathematical calculations and IF/THEN comparisons.

The next section deals with sound and graphics, sound generation is dealt with fairly concisely – the book is adequate, but not outstanding in this section. It is in its description of graphics, that the manual really shows signs of weakness. Although the modes 0 to 7 are dealt with in a very clear and concise way, and once again I think the beginner will find this very helpful, modes 8 to 15 are not even mentioned.



This, I feel, is a great shame, since these are probably the most interesting and versatile of the graphics modes available to the programmer. Modes 9 to 11, for example, have never really been explained in previous Atari manuals and yet they have been available since the days of the 400/800 machines. Their most interesting facet is the ability to produce realistic camera pictures with the use of a suitable video interface. Also amongst modes 12 to 15, there are some which are excellent for medium resolution 'painted' pictures (there is the special modė used by MICRO-PAINTER and other good 'painting' utilities), and these could do with explaining.

VERDICT:– Although largely a vast improvement on previous efforts, this manual seems to stop abruptly halfway through the graphics section! It is very sad that Atari computers have the most advanced and varied graphics available on a home computer, and yet Atari still don't even tell owners about it in the manuals. Still, it is definitely a step in the right direction.

THE PHYSICAL LAYOUT

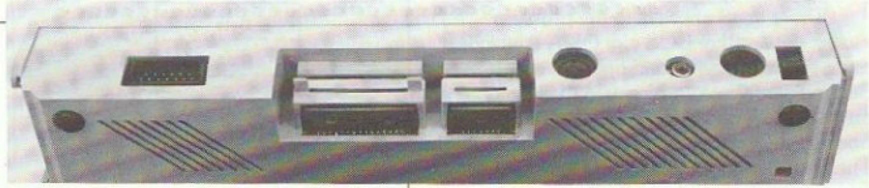
First impression is of the machines compactness. The reduction in width has been achieved by moving the function and reset keys to above the keyboard. Their diagonal shape has more to do with artistic appeal than practical useability, but nonetheless they do enhance the machines visual appeal, and the 130XE is certainly the smartest looking machine produced by Atari. I don't know whether it was intentional, but I found the ridge running across the machine (just above the logo) was very handy for laying pens in while programming!

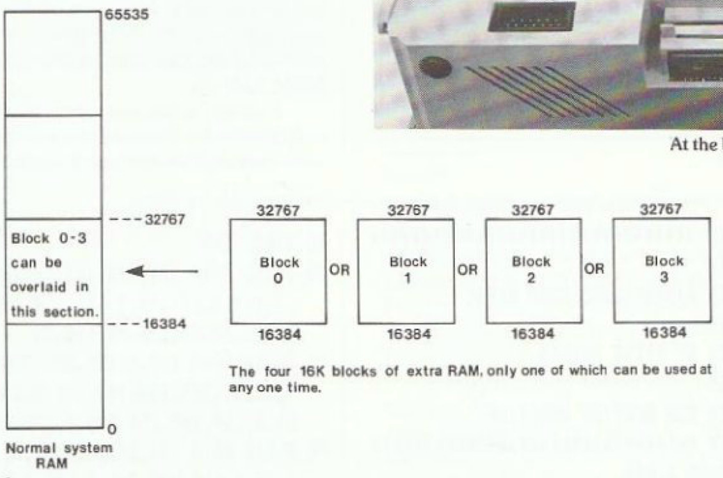
There were, however, two aspects of the new machines case which I found rather irritating, the first of these being the location of the RESET key. This is placed just above the DELETE and BREAK keys, with an exposed edge facing them. Several times I have accidentally touched this key (it also has a very light spring), and since I use a disk drive, the computer cold-started itself with the inevitable loss of my program most frustrating!

The other problem is in the characters printed on the keys of the main keyboard. They have been printed in a rather light grey colour, and consequently the finer punctuation keys require very good lighting conditions to locate them reasonably easily. I also thought that some of the punctuation marks were needlessly small. Indeed, I found the coma and full-stop virtually impossible to differentiate without close examination, and this applies equally to the colon and semi-colon. Larger, bolder, black lettering would, I feel, have made the keyboard much nicer to use. As far as the keys themselves are concerned, I must say that I found them excellent. They have a beautifully light, rapid feel about them, I found that I could type much faster on the 130XE than on my old 800 – something which I attribute to their relatively short travel and 'bouncy' feel.

A look inside the machine revealed the usual well screened, high quality circuit board which we have come to expect of Atari. Something I did find a little disappointing was that all the IC's were soldered directly into the PCB, thus making servicing much more difficult. I suspect that this has probably been done to help reduce costs, increase reliability, and cut down on inter-component interference, but it will be interesting to see how Atari deal with servicing, particularly on out of warranty machines when the time comes. It is interesting to notice that there are very few small scale logic IC's (3 TTL and 3 CMOS chips), an example of the trend towards large scale integration (LSI) IC technology, packing as many functions as possible into as few IC's as possible, hence the cluster of large IC's. We all, of course, benefit from this with cheaper, more powerful machines.

VERDICT: – Despite the few niggly points, this is certainly the neatest and most professional looking Atari computer to date.


At the back



The four 16K blocks of extra RAM, only one of which can be used at any one time.

Diagram 1

THE EXTRA RAM

Now for the part which really does make the 130XE different to its predecessors. The 130XE is supplied with a total of 128K of random access memory (RAM), twice as much as the 800XL. Marvellous, I here you say. But if you plug your machine in, switch on and type: – PRINT FRE(0)

It responds with 37902, the same as it did with the 800XL (64K less the amount banked out to allow BASIC and the operating system to exist). Here is the catch, the additional 64K is not there to use as normal memory!

The problem is that the 6502 CPU, like all 8 bit processors with 16 bit address lines, can only 'talk' to up to 64K of continuous memory (ROM or RAM), in use.

So, where then is this extra 64K lurking in the 130XE? Firstly, you must realise that the 130XE will not be able to run a BASIC program any larger than the 800XL, in fact the 130XE will operate in precisely the same way as the 800XL, this is why it is 100% compatible with existing XL Atari software. The additional 64K exists as 4 separate 16K blocks and the only way it can be accessed is by disabling a 16K block of normal memory and placing a chosen block of the extra memory in its place. You can do this by poking to memory location 54017. Once this is done however, you can not access the original 16K memory block until it is re-enabled. Diagram 1 shows how this happens a little more clearly.

It is also possible to have the main processor (6502 CPU) accessing the system memory as normal, but have the display processor (ANTIC) accessing the extra RAM, and vice versa. This is because the control register in location 54017 uses 2 bits to decide which type of memory the two processors will use, one for the 6502 and one for the ANTIC. Two more bits are used to indicate which block of memory is to be used if the extra memory is selected by either of these.

Notice where the extra RAM is overlaid, it is in the second 16K section (locations 16384 to 32767). This is the obvious choice since the 0 to 16383 section holds the valuable system information which, if it is unavailable briefly, or was to get corrupted, would cause the computer to lock-up, or crash. The third 16K RAM section (32768 to 49151) holds the screen data, and 8K of this is often switched out to allow BASIC, or cartridge software to operate, so this is out of bounds. The top 16K section (49152 to 65535) is where the operating system lives in ROM, so it is also out of bounds. This only leaves the second 16K section, locations 16384 to 32767, to use as a 'window' to the extra RAM. This area is free when you switch on, but as your BASIC program grows, it will eventually reach and cover it. The problem then is that when you attempt to enable and access the extra RAM using BASIC commands (e.g. PEEK and POKE) you might actually disable your programmes memory space and crash BASIC!

This problem of conflict of memory would, at first, seem to prevent the use of the extra RAM by a BASIC program for data storage, but this need not necessarily be so. There are two ways around the problem: –

a) Ensure that the BASIC routine which accesses the extra RAM lives outside the 'window' section. You can find the approximate position in RAM of a program line by including the following command on the same line: – PRINT ADR("")

This seemingly pointless command will in fact print the address of the non-existent string in the quotes! Consequently you will know the approximate location (to within 4 or 5 bytes) of the program line.

b) Use a machine code subroutine located outside the second 16K section of memory to perform the access to the extra RAM. This is the fastest, neatest and most reliable method, but unfortunately not everyone knows how to write in machine code. For those who do, Atari BASIC provides an excellent method of interfacing machine code routines to a BASIC program, the USR function.

An application which the extra RAM is suited for is a RAMDISK. A RAMDISK is a large block of memory with a piece of machine code software which simulates a disk drive, so that programs which regulary access a file at random positions can be fooled into thinking the memory is a disk drive. This increases the speed of such a program enormously, as well as reducing drive wear.

Other applications which could benefit from having the extra memory are word processors, program text editors or database type programs. Atari have stated that any software packages produced for the 130XE will be made compatible with the older Atari computers, but perhaps with some features lost. It will certainly be interesting to see whether they stick to this.

VERDICT: – The extra 64K is a superb feature which should ensure the survival of the Atari machines. It opens up the way for many exciting possibilities such as a RAMDISK, large database programs, perhaps even a decent 'spelling checker' type word processor. Adventure games that use graphics can be vastly improved, avoiding the need to load each screen separately from disk.

When you take all the possible future benefits into consideration, and the fact that by upgrading you will not loose out to any kind of incompatability with the software you already have, finding the measley £170 to buy one is a temptation not easy to overcome. It will be an investment worth every penny!

I would like to thank Silica Shop for sending me the 130XE for review so soon after they arrived in the U.K., its nice to know that someone out there is supporting the Atari computers with enthusiasm.

Binary Loads From BASIC

by Steve Hillen

There have always been a number of problems in loading a binary load file from BASIC. These problems stem mainly from the fact that another DOS file must be loaded itself in order to load a binary file for you. This file will either overwrite your BASIC program, or force you to wait for ages while a section of memory is saved out under a MEM.SAV file. Another problem is that the DOS loader will protect itself and not allow any loads over its region of memory, a region which is normally user space.

There are 3 answers to the problem. Firstly, get another DOS e.g. OS/A+ which has a resident binary load option. Secondly, make your binary load file into an AUTORUN.SYS file, so it is loaded on boot-up, bypassing the second DOS file. These two solutions are either expensive or inconvenient, so perhaps the compromise solution is to have a short routine to perform the load for you.

Before the listing explanation however, a quick reminder on the structure of a binary file.

STRUCTURE

It is basically a memory dump onto disk (or cassette) with a special 6 header bytes which determine where to load the file, and how much there is to load. Referring to Figure 1, the first two bytes are a mandatory 255,255 which specify that it is a binary file. The next two bytes are the lo,hi address at which to start the load. The 5th and 6th bytes are the lo,hi address at which the load will end. Following the first 6 bytes is the data which is to be loaded between the two addresses.

A binary load file does not stop there though. Depending on how it was created, it could have a number of supplementary files appended to the end. Such a file is known as a compound file. The only difference between these extra sections and the first, is that the first two 255's may or may not be included. The four address bytes and the specified amount of data will still be there, however.

The listings below are for a BASIC binary load option, which occupies most of Page 6 in memory. Once installed, you can call it with: –

X=USR(1536,ADR("D:FILENAME.EXT"))

Where you supply the filename you want to load. At the moment, the routine will not load any program between page 6 and page 31, in order to protect itself and the resident DOS. The upper and lower bounds can be altered by poking 1605 and 1609 respectively with the new bounds.

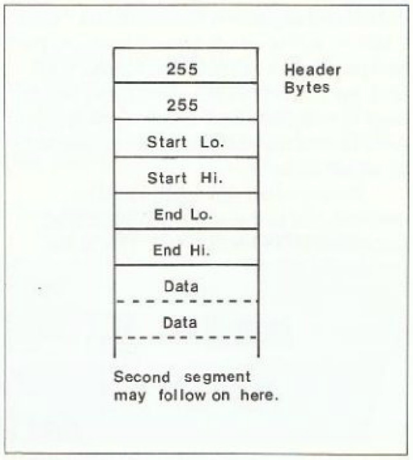


Figure 1

You will also notice that the program will print the memory ranges loaded in hex, and there are two things to look out for. If the file loads into $2E0-$2E1 then those two locations hold the RUN address for the file. If it loads into $2E2-$2E3 then those two locations hold the INIT address for the file.

Type in listing 1 and save it out before running it. As it stands, the program will read the data into page 6 then stop. If you delete line 10 however, the program will create a binary load file of itself, which you can load once with DOS, then load any further binary files without the need for MEM.SAV etc.

Listing 2 is the assembly code, and is only shown for more advanced readers who may wish to see how it works.

NOTE: In this program, anything which is underlined, should be entered in 'INVERSE'.

```
EI 1 REM ******************************
NH 2 REM
JS 3 REM BINARY LOAD FROM BASIC
NJ 4 REM
TF 5 REM BY STEVE HILLEN
NL 6 REM
YN 7 REM FOR MONITOR MAGAZINE
EQ 9 REM ******************************
GW 10 GOTO 31000
VO 100 REM *** Create binary load file. *
   **
EE 110 DIM IN$(1)
IM 120 ? "Ready disk with DOS and press <
   CR>";:INPUT IN$
KG 130 TRAP 200
JF 140 OPEN #1,8,0,"D:BINARYL.OBJ"
YM 150 PUT #1,255:PUT #1,255:PUT #1,0:PUT
    #1,6:PUT #1,244:PUT #1,6
IW 160 FOR A=0 TO 244:READ D:PUT #1,D:NEX
   T A
PB 170 CLOSE #1:? "Done.":END
DI 200 ? "Error ";PEEK(195):CLOSE #1:END
RQ 31000 REM *** Load data onto page 6 **
   *
QH 31001 FOR A=0 TO 244:READ D:POKE 1536+
   A,D:NEXT A
HX 31002 REM *** Ready to use. ***
XO 31003 REM *** X=USR(1536,ADR("D:FILENA
   ME.EXT")) ***
YO 31006 END
VQ 31010 DATA 104,216,162,16,169,3,157,66
   ,3,169,4,157,74,3,104,157,69,3,104,157
   ,68,3,32,86,228,48,116,32
TU 31011 DATA 123,6,201,255,208,109,32,12
   3,6,201,255,208,102,160,0,132,203,32,1
   23,6,164,203,153,208,0,200,192,4
PP 31012 DATA 144,241,32,152,6,165,208,15
   7,68,3,165,209,201,6,144,4,201,31,144,
   67,157,69,3,56,165,210,229,208
BA 31013 DATA 157,72,3,165,211,229,209,15
   7,73,3,254,72,3,208,3,254,73,3,32,131,
   6,32,123,6,133,208,32,123
LB 31014 DATA 6,201,255,240,180,133,209,1
   60,2,208,176,169,0,157,72,3,157,73,3,1
   69,7,157,66,3,32,86,228,16
BT 31015 DATA 10,104,104,169,12,157,66,3,
   32,86,228,96,160,0,165,209,32,206,6,16
   5,208,32,206,6,200,165,211,32
IZ 31016 DATA 206,6,165,210,32,206,6,162,
   0,169,9,141,66,3,142,73,3,169,127,141,
   72,3,169,6,141,69,3,169
VE 31017 DATA 235,141,68,3,32,86,228,162,
   16,96,162,1,72,74,74,74,74,9,48,201,58
   ,144,2,105,6,153,235,6
AM 31018 DATA 200,202,48,6,104,41,15,76,2
   13,6,96,70,70,70,70,45,70,70,70,70,155
```

Listing 1

Listing 2

```
00001 ;Binary load files from Basic
00002 ;Written on SynAssembler
00003 ;
00004 ;Called by
00005 ;X=USR(1536,ADR("D:FILENAME.EXT"))
00006 ;
00007          .LI OFF
00008          .OR $600     Page 6
00009          .TF "D:BINLOAD.OBJ"
00010 ;
00011 ;CIO Equates
00012 ;
00013 ICCMD    .EQ $342     Command byte.
00014 ICBAL    .EQ $344     Buffer address low.
00015 ICBAH    .EQ $345     Buffer address high.
00016 ICBLL    .EQ $348     Buffer length low.
00017 ICBLH    .EQ $349     Buffer length high.
00018 ICAX1    .EQ $34A     Auxiliary byte 1.
00019 ;
00020 ;CIO commands
00021 ;
00022 OPEN     .EQ $3       Open file.
00023 CLOSE    .EQ $C       Close file.
00024 GET      .EQ $7       Get bytes.
00025 PUT      .EQ $9       Put bytes.
00026 ;
00027 CIOV     .EQ $E456    CIO entry vector.
00028 ;
00029 ;My workspace.
00030 ;
00031 BUFFER   .EQ $D0      Four bytes space.
00032 TEMP     .EQ $CB      One byte space.
00033 ;
00034 ;
00035 START    PLA          Clear stack.
00036          CLD          Clear decimal.
00037          LDX #$10     Set to IOCB #1.
00038          LDA #OPEN    Open the file.
00039          STA ICCMD,X
00040          LDA #4       Direction is read only.
00041          STA ICAX1,X
00042          PLA          Filespec address
00043          STA ICBAH,X is passed on the
00044          PLA          stack and saved
00045          STA ICBAL,X into the buffer addr.
00046          JSR CIOV     Let CIO open file.
00047          BMI ENDED    If Y -ve then error.
00048 ;
00049          JSR GET1     Get one byte from file.
00050          CMP #$FF     Must be 255 for
00051          BNE ENDED    a binary load file.
00052          JSR GET1     Same for second byte.
00053          CMP #$FF
00054          BNE ENDED
00055 ;
00056 AGAIN    LDY #0       This loads 4 bytes
00057 GET4     STY TEMP     from the file
00058          JSR GET1     and saves them in
00059          LDY TEMP     buffer- thes 4 are
00060          STA BUFFER,Y the start and end
00061          INY          load addresses for
00062          CPY #4       the file.
00063          BCC GET4
00064 ;
00065          JSR PRINT    Print the start/end addr.
00066 ;
00067          LDA BUFFER   The start load goes
00068          STA ICBAL,X into the buffer addr.
00069          LDA BUFFER+1 Check that file will
00070          CMP #6       not overwrite
00071          BCC OK       above Page 6
00072          CMP #$1F     and below
00073          BCC ENDED    page $1F (protect DOS)
00074 OK       STA ICBAH,X
00075          SEC          Now subtract start
00076          LDA BUFFER+2 addr. from end
00077          SBC BUFFER   addr. and add 1
00078          STA ICBLL,X to get the length
00079          LDA BUFFER+3 of the file to load.
00080          SBC BUFFER+1
00081          STA ICBLH,X
00082          INC ICBLL,X
00083          BNE JUMP
00084          INC ICBLH,X
00085 JUMP     JSR PART2    Load the file.
00086 ;
00087          JSR GET1     Test for compound file.
00088          STA BUFFER   Save for later
00089          JSR GET1     Get another-if it's 255
00090          CMP #$FF     then need another 4 bytes.
00091          BEQ AGAIN    If not, then those 2
00092          STA BUFFER+1 were the start load addr.
00093          LDY #2       Specify two bytes only
00094          BNE GET4     and get them!
00095 ;
00096 GET1     LDA #0       If length set to 0,
00097          STA ICBLL,X one byte is returned
00098          STA ICBLH,X in A.
00099 PART2    LDA #GET     Set for get byte.
00100          STA ICCMD,X
00101          JSR CIOV     Get byte.
00102          BPL BACK     No error if Y +ve.
00103          PLA          Clear last RTS.
00104          PLA
00105 ;
00106 ENDED    LDA #CLOSE   Close the file.
00107          STA ICCMD,X
00108          JSR CIOV     and exit to Basic.
00109 BACK     RTS
00110 ;
00111 PRINT
00112          LDY #0       This section changes
00113          LDA BUFFER+1 the first 4 hex
00114          JSR HTOP     bytes in Buffer
00115          LDA BUFFER   to a printable 8 bytes.
00116          JSR HTOP
00117          INY
00118          LDA BUFFER+3
00119          JSR HTOP
00120          LDA BUFFER+2
00121          JSR HTOP
00122 ;
00123          LDX #0       Specify IOCB 0
00124          LDA #PUT     Put a record.
00125          STA ICCMD    Set buffer length.
00126          STX ICBLH
```

```
00127         LDA #$7F
00128         STA ICBLL
00129         LDA /MESSAGE Point to message to
00130         STA ICBAH   print to screen.
00131         LDA #MESSAGE
00132         STA ICBAL
00133         JSR CIOV    Let CIO print.
00134         LDX #$10    Restore IOCB 1
00135         RTS
00136 ;
00137 ;
00138 HTOP    LDX #1      Set index.
00139         PHA         Save for later.
00140         LSR         Shift high nibble
00141         LSR         to low nibble.
00142         LSR
00143         LSR
00144 CORRECT ORA #$30    Put in ASCII offset.
00145         CMP #$3A    And correct for hex
00146         BCC NOTHEX  numbers.
00147         ADC #6
00148 NOTHEX  STA MESSAGE,Y Store.
00149         INY
00150         DEX
00151         BMI RET     Both done.
00152         PLA         Restore A
00153         AND #$0F    Get low nibble.
00154         JMP CORRECT and change to ASCII.
00155 RET     RTS
00156 ;
00157 MESSAGE .AS "FFFF-FFFF"
00158         .HS 9B
```

CROSSWORD COMPETITION RESULT

We had an overwhelming response to the crossword competition, and it took a lot of work to sort out the correct entries and put them into the proverbial hat, ready for picking the winner. Surprisingly there was only seven correct entries, so we probably made the clues a bit too difficult. Next time we will make them a bit easier!

Our congratulations to Liz Ahmedzai from Chatham in Kent for being one of the seven and for having the good fortune to have her name pulled from the hat. We hope the £10 came in handy Liz! Also our condolences to the six who got it right but get nothing for their efforts.

To put all of you who are curious about the answers out of your misery, here they are:

Answers ACROSS 3)Jack Tramiel, 6)Interface, 9)ROM, 11)Byte, 12)List, 13)Binary, 15)Page, 17)Command, 19)Tiny, 20)Sector, 22)Terminal, 24)Disk Drive, 26)Mode, 30)Decimal, 31)Recursive, 34)Via Tape, 35)Language, 37)Integer, 38)Keyboard, 39)Open.

Answers DOWN 1)Antic, 2)Zero, 4)Error, 5)Bit, 7)Cassette Recorder, 8)Structured, 10)Manual, 14)Joystick, 16)System, 18)String, 21)DIM, 23)Atari, 25)Array, 27)Next, 28)Nibble, 29)New, 30)Data, 32)Even, 33)Bug, 35)Loop, 36)Game.

MONITOR ON DISK

Like the look of a program but can't find time to key it in? You've asked the wife three times to do it for you whilst you're out at work, and she still hasn't. Or maybe you have typed it in but it won't run. Then why not take all the effort out of it and send for the MONITOR DISK. All the main programs in each issue of MONITOR are now available pre-recorded on disk for you. They cost £4.95 which includes postage and packing, send a cheque/postal order made payable to the 'U.K. Atari Computer Owners Club' to Monitor Magazine, P.O. Box 3, Rayleigh, Essex. If you live in Europe add 50p, if outside Europe add £1.00. Please allow 28 days for delivery.

Monitor Disk 8.
Includes: Quickplot, a fast Graphics 8 Plot/Drawto handler. Nightmare Reflections, an exceedingly frustrating adventure. Matchbox, improve your concentration with this memory game. Interrupts, 5 demo programs showing various uses of interrupts.

Monitor Disk 9.
Includes: Keyo, a new typing checker. Multiboot Bootbase, database program for 'Multiboot disks'. Binload, binary loads from Basic. Happytyper, automatic line numbering. Ramdisk, for use with the 130XE. Fast Fill, a speedy shape filling utility.

STOP PRESS STOP PRESS

A new word processing package is soon to be released (August) by Precision Software for use on the XL/XE range. It will be supplied on disk with a fully comprehensive manual which includes a training course. The word processor is menu driven with single command selection plus user defined selection, it also has a calculator, mail merge facilities, a dictionary of over 20,000 words (which is also user definable) and can be used as a spelling checker. Various Printer set up files are included (yes, these are user definable too). Although it is menu driven, for more experienced users all commands can be inserted directly into the text. The package is being marketed under the 'Superscript' brand name and will be on display at the PCW show at Earls Court in September. The price will probably be £69.95, which sounds a lot but after having seen a preview copy and being totally impressed with the quality of the program, came to the conclusion that it will be a bargain!

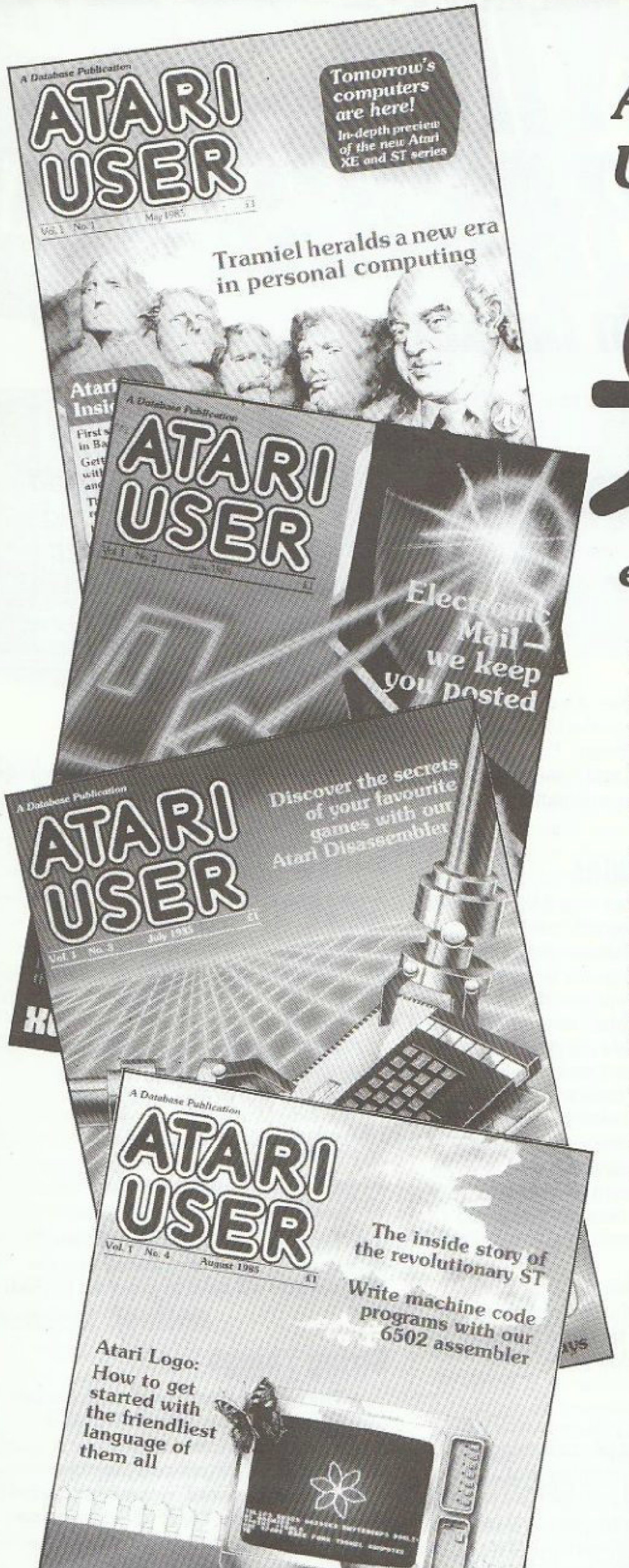
Superscript
THE COMPLETE WORD PROCESSOR FOR THE ATARI
BY S.D. Tranmer
(c) PRECISION SOFTWARE LTD
ATARI
MAGAZINE

A new 'Magical' adventure from Level 9 called 'Red Moon' is to be released on 15th July. It is cassette based, text with graphics, and will retail for £6.95. If it is as good as their others its worth looking out for.

Discovered in amongst the pile of letters we receive at H.Q. was the first issue of a new newsletter for Atari fans. It is pretty good, we liked the 'Atariman' cartoon strip best (wish we had thought of it!). Named 'GTIA Gazette', details are available from Mike Lynch, 24 Oakdene Road, Anfield, Liverpool, L4 2SR.

On the subject of newsletters, we have been sent a copy of 'Atari Magazine' which is published by Stichting Atari Gebruikers in Holland. It is a professionally printed newsletter full of tips and listings and although its all in Dutch and we could'nt read it, it was fun typing in the programs just to find out what they did. If you are interested, we are sure Casper Jansen would love to here from you (no, you don't have to write in Dutch, he speaks English). Write to Postbus 40181, 6504 AD Nijmegen, Holland.

There are very strong rumours that Atari Corporation have booked three massive stands at the forthcoming PCW show at Earls Court in September, we have also heard that Silica Shop and Precision Software will be there, and its a possibility that Page 6 magazine will have a stand too. If all this comes to pass, it will be a show not to be missed by any Atari enthusiast.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STARTING FROM BASICS

by Captain Hacker

Welcome to the second part of my column for the beginner. This is where I hope to alleviate the confusion experienced by the novice who wants to get a foothold into the world of programming. In this issue I will deal with the way elements of information are held in the computer. There are two types of information (or data) that can be manipulated in a program, the first is numeric values, and the second is letters, or words.

Numbers

In the last issue I told you a little about the PRINT command, and how to use it to print your name to the screen. Since I will now use this command, it is important that you read and understand the article in the last issue, (Back Issues are available). Let us suppose that we want to print the number 2 onto the screen. This is very simple, just type:–

```
PRINT 2
```

Press RETURN on your computer and you will see that it obediently places a 2 on the next line, just as instructed! Suppose though, that you want to do something more useful with numbers, what can your computer do? Well, in fact, your computer can perform any of the basic mathematical operations for which you might normally use a calculator, i.e. add, divide, subtract and multiply. It can also perform the kind of functions which you would normally find on a good scientific calculator, such as SIN, COS, LOG, etc.

If I decide that I want my machine to add two and four together, I would simply type:–

```
PRINT 2+4
```

Try it, and you will see that it prints 6 on the next line. What about subtraction though? Type:–

```
PRINT 4–2
```

This, of course, gives the answer 2. When adding or subtracting, I use the same keys as on a calculator, but for multiplying and dividing I have to use different symbols. For multiplying I use the ASTERISK, i.e.:–

```
PRINT 4*2
```

With the result of 8 being printed.

For division I use the symbol which is refered to by programmers as a SLASH, i.e.:–

```
PRINT 4/2
```

This gives the value of 4 divided by 2. All these symbols are on the lower right-hand side of your keyboard. Experiment with them for a while, and remember that they can be used in a combination, thus:–

```
PRINT 4*3/2-5+1
```

Numeric Variables

Let us suppose that I want to hold a numeric value in a program, but I want to alter it in various ways as the program progresses. To do this I have to use a VARIABLE. You can imagine this as a pot, into which I may place a number. I can alter the value in this pot using any of the mathematical functions I experimented with earlier, and I can have as many 'Pots' as I wish, but how do I refer to them, or tell them apart from each other? I just label each pot separatley, just as if I were actually labelling different types of jam, I stick imaginary labels onto my imaginary 'Pots'! I refer to the label as the VARIABLE NAME.

To create a number pot I need only refer to its name and the computer will automatically make a space for it in its memory. Type the following:–

```
A=1
```

Notice that when you press RETURN the computer does not print anything. All it has done is to create a number 'Pot', place the value 1 into it, and then labelled it with the letter 'A'. Many computers only permit VARIABLE NAMES of one character length (i.e. A,B,C,D, etc) but fortunately, the Atari allows names of almost any length. The only limitation is that you must NOT use words which are themselves commands, such as PRINT or GOTO, (these are called reserved words). I can print the contents of a variable in the same way as I would print a literal number, e.g.:–

```
PRINT A
```

In fact, I can treat number variables in exactly the same way as I would treat numbers themselves, i.e.:–

```
PRINT A+5
```

The answer will be 6, since the last operation I performed on the variable A was to force the number 1 into it. Experiment with the following command lines on your screen:–

```
A=A+2
PRINT A
B=7
PRINT A+B
PRINT A*B
PRINT A/B
```

To show how to use a number variable in a program, here is a short program for you to type in:–

```
10 A=1
20 PRINT A
30 A=A+1
40 GOTO 20
```

Type RUN after you have entered each line, but remember that to stop the program you will have to press the BREAK key!

String Things

The second kind of information dealt with in a computer is called STRINGS. A string is the term used to describe a collection of letters grouped together, usually to form a word. Remember that in the last issue I used the PRINT command to print a name to the screen, thus:–

```
PRINT "JACK"
```

Well let us suppose that, rather than quote the name directly, I would prefer to store the name JACK into one of our imaginary pots, (the same as I did with numbers) and give it a label. I can do this, but I somehow need to show the computer that I am dealing with a string, rather than a number variable. This is done by putting a dollar sign after the variable name (or label). For example, whereas I use the name A for our number variable, I must use A$ as the name for my string variable, (the dollar sign is always refered to by programmers as 'STRING' – i.e. B$ is read as "B string").

It is here, however, that I encounter a slight problem. Numbers are stored in the computer's memory in a specially coded form which requires a fixed amount of room, regardless of the value. Strings, are a little more awkward. Because I might want my imaginary pot (or string variable) to hold either a short name, or perhaps a whole sentence, the amount of memory space needed to hold a string variable might vary enormously, and this poses a problem for the computer. What I need to do is to somehow tell the computer how much room to allow for my string variable. This I do at the very beginning of my program, using the DIM command, (short for DIMension). Suppose that I decide I want to use a string variable named A$, and that the longest I think it will be is ten characters. I declare this with the following line: –

```
10 DIM A$(10)
```

I can now use the variable A$ and place whatever characters I want into it. For example: –

```
20 A$="JACK"
```

Type NEW, and enter lines 10 and 20 as above, then type RUN. You have now stored the word JACK in the variable A$. Notice, however that although line 10 prepared A$ for up to ten characters, you only used four of them. This is an important point, since in line 10 you told the computer that you MIGHT want to have A$ up to 10 characters long, but since you do not have to use all of the space you have reserved for it, the computer also keeps track of how long A$ really is. If you now type: –

```
PRINT A$
```

The name JACK has dutifully been stored in the variable labelled A$, and as you will see, you can print its contents in the same way as a number variable. Type LIST and you will again see the program lines you have entered. Now type NEW and try LIST again. You will find that your program no longer exists! This is the way to clear the computer's memory and tell it that you want to enter a different program. Type in the following: –

```
10 DIM A$(10), B$(10)
20 A$="JACK":B$="SMITH"
30 PRINT A$:PRINT B$
40 PRINT A$,B$
50 PRINT A$;B$
60 PRINT A$;" ";B$
```

Type RUN, and you should see the following printed on your screen: –

```
JACK
SMITH
JACK          SMITH
JACKSMITH
JACK  SMITH
```

Examine the program carefully. Notice that I was able to DIMension A$ and B$ at the same time by separating them with a comma. Notice also that, as on line 20, it is possible to have more than one separate command on one line number. To do this you must separate the two commands with a COLON. On line 20 the two commands are both PRINT commands, but they could actually be two completely different commands, and in fact you could have more than just two, the only limitation to how many you have is that you cannot exceed the length of three screen lines!

Cutting Up Strings

One of the very useful functions of Atari BASIC is the ability to print, examine or alter any part of a string. Suppose that I have a string variable, (call it A$) which holds the words 'MY ATARI COMPUTER', and I want my program to print the middle word 'ATARI'. In order for it to pick out part of A$ I must tell it two things: the positions of the first character and the last character. The A of ATARI is the fourth character in A$, and the I is the eighth, so I would write this as A$(4,8). Type NEW, then enter the following example to demonstrate how this is used in practice.

```
10 DIM A$(20)
20 A$="MY ATARI COMPUTER"
30 PRINT A$
40 PRINT A$(4,8)
```

The result should look like this: –

```
MY ATARI COMPUTER
ATARI
```

Now, without erasing the program so far, enter the following additional lines.

```
50 A$(4,8)="HOME "
60 PRINT A$
```

Type RUN, and you will see the following on your screen: –

```
MY ATARI COMPUTER
ATARI
MY HOME COMPUTER
```

So you can see that you can also force a different string into part of another string as well, a very useful feature indeed – as you will no doubt discover in time! Something which you should note here is that the spaces in the strings actualy count as a character. I said earlier that you can use a number variable in place of a literal, or fixed number, and this is certainly true here. Type NEW, and type in and then RUN the following program then you will see what I mean!

```
10 DIM A$(20)
20 A$="MY ATARI COMPUTER"
30 A=1
40 PRINT A$(1,A)
50 A=A+1
60 GOTO 40
```

The program should print to your screen the following: –

```
M
MY
MY
MY A
MY AT
MY ATA
MY ATAR
MY ATARI
MY ATARI
MY ATARI C
MY ATARI CO
MY ATARI COM
MY ATARI COMP
MY ATARI COMPU
MY ATARI COMPUT
MY ATARI COMPUTE
MY ATARI COMPUTER

ERROR 5 AT LINE 40
```

Notice the error message. If you try and make the computer do something that is not possible it tells you so, and in a very precise way. The computer tells you what line number the problem occured on, and in this instance the error occured on line 40. You are also told what went wrong, but there are around 50 different kinds of errors, so rather than explain it to you the computer prints an error number – in this example error 5. Now you will need to look through your BASIC REFERENCE MANUAL and find the table of ERROR CODES. You will then see that ERROR 5 means STRING LENGTH ERROR.

This type of error usually occures when you try and reference part of a string which is beyond the current length of this string, and so does not exist. If you look at line 40, you will see that the offending number must be in the variable A. So let us find out what value caused the error. Type: –

```
PRINT A
```

You will find that it holds the number 18. Since, in line 20 you have only placed 17 characters into A$ it is illogical to try and print up to the 18th – hence the program 'crashes' with error 5.

Hopefully, by now you are reasonably familiar with strings and numbers, and are able to write short programs to manipulate and examine them, but suppose that you would like your program to ask you for a number or a string – how is this done?

Using the INPUT Command

The INPUT command is one of the most valuable commands available to you. It forces the computer to pause and wait for you to type a number or string on your keyboard, and it will continue with the program as soon as you press the RETURN key. Try the following program: –

```
10 INPUT A
20 PRINT "THE NUMBER TYPED WAS ";A
30 GOTO 10
```

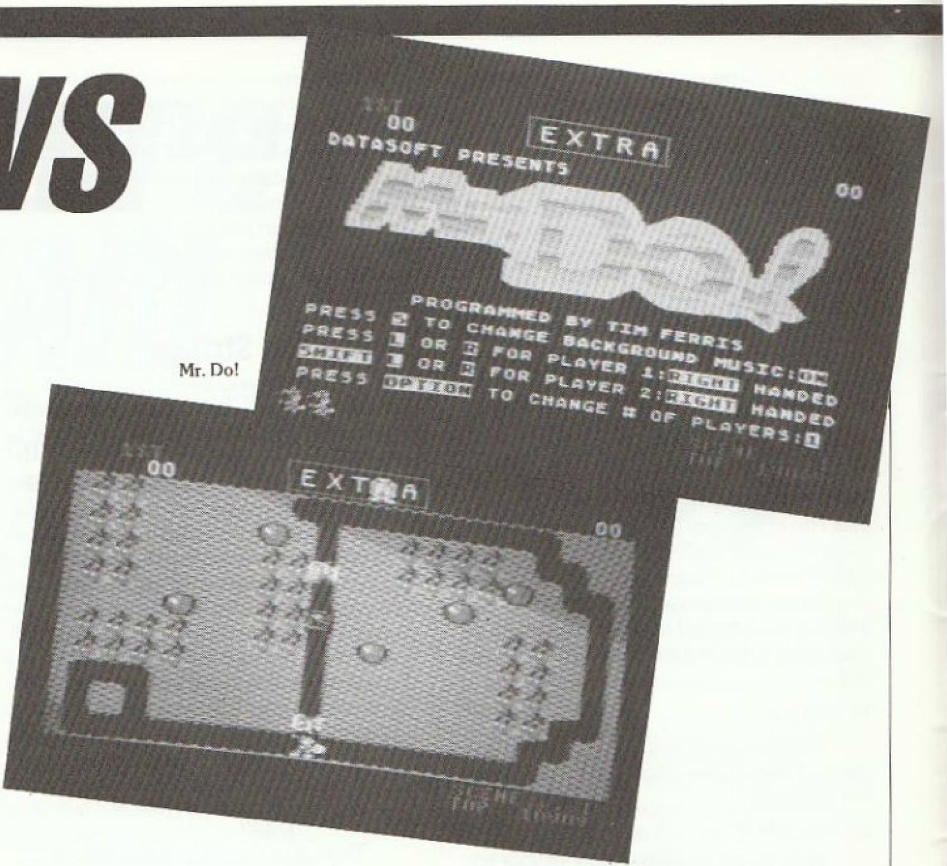
You could consider the INPUT command as being the opposite to the PRINT command. They both work with strings as well as numbers, as you will see by trying the following: –

```
10 DIM A$(100)
20 INPUT A$
30 PRINT "YOUR STRING IS ";A$
40 GOTO 20
```

Notice that when your program is waiting for you to type something the computer prints a question mark (?) as a prompt. Whatever you type then goes straight into the variable you mention with the INPUT command. Something which you must remember is that if your program asks for a number to be entered (e.g. using INPUT

Continued on page 13.

REVIEWS


00
EXTRA
DATASOFT PRESENTS
00
PROGRAMMED BY TIM FERRIS
PRESS TO CHANGE BACKGROUND MUSIC:ON
PRESS OR FOR PLAYER 1:RIGHT HANDED
SHIFT OR FOR PLAYER 2:RIGHT HANDED
PRESS OPTION TO CHANGE # OF PLAYERS:
00
EXTRA
00

Mr. Do!

MR. DO!

48K Cassette £9.95 Disk £14.95 from US Gold.
Reviewed by Gary Cheung.

Starring as a cute little clown, I went out on my daily round of cherry picking. As usual, those little monsters are out to stop me, but I am determined and armed! Clutching my trusty power ball, I push my way through the earth and set up my trap. I can almost smell those meanies coming up the tunnel as I push a big red apple upon them. Whilst savouring that satisfying little victory, another monster creeped into view and, with what can only be pure reflex, I hurled my power ball and sent it to another dimension!

Having flattened some monsters, I came upon the lair and discovered one of the fabled centre treats. Wow! a dish of ice-cream, yum, yum! Soon after I had polished this off, I heard some strange marching sounds. Oh, Oh! Its the Boss Monster and it's dreaded henchmen. I've got to run!

Mr. Do! is a very good translation of the arcade game of the same name. As you may have gathered, its a digging game. You pick up cherries as you tunnel through a cherry field, while being pursued by various monsters. Points are gained by picking cherries, eating the centre treat, killing the monsters and picking up the legendary Lucky Diamond. Extra Mr. Do!'s are awarded, not by points, but when all five types of Boss Monsters are killed. Boss Monsters are marked with the letters E, X, T, R or A, hence they are also known as EXTRA letter monsters!

Regular Monsters move along pre-dug tunnels and can be killed by your power ball or a falling apple. Diggers are the only monsters that dig tunnels (just as well!) and can be killed in the same way. Beware, Regular Monsters can turn into Diggers! A Boss Monster appears at every 5000 points and when you eat the centre treat, the henchmen follows! The Boss and its dreaded henchmen cannot always be destroyed by falling apples, but killing the Boss will change its henchmen into apples.

Mr Do! features very good graphics and nice little tunes. There are many nice touches, such as, your Mr. Do! changing poses as he moves, the Regular Monsters eyes and legs move and, the henchmen wobble as they chomp on the apples. When an extra Mr. Do! is awarded, a cartoon shows your Mr. Do! strolling up to a monster and hurling a power ball at it, the monster starts to sweat (it sure looks like sweat!) and waves a white flag in surrender! Datasoft claims that there are virtually a limitless number of screens, but I found that screen 11 is nearly identical to screen 1, screen 12 to screen 2 and so on. There is only one gripe, that is the cassette version loads in five parts and takes over 16 minutes! Another thing (did I only say one? Sorry!) the disk version cost £5 extra!! Having said all that, it is a very addictive game and beats Pacman and Dig Dug hands down. I can recommend it to any arcade gamer who likes a little strategy.

A TIP FOR BEGINNERS.

To set up a trap, dig straight upwards to a position adjacent and one step below an apple. Now pass under the apple and it will fall behind you. Then turn around and push the apple slightly so that it just sticks out into the vertical tunnel. To get the maximum points, wait until lots of monsters are in the tunnel then push the apple onto them.

Top-DOS. The Ultimate DOS

32K Disk, Price £37.95
Reviewed by Matthew Tydeman.

I've always been a great fan of Atari's menu driven DOS 2.0s, it is simple and very user friendly. Atari's DOS 3.0 was a step back for Atari in my eyes, as it was for many other people I know, who have encountered it.

I use DOS 2.0s regularly and I like all my DOS systems to be compatible with each other (thats why DOS 3.0 was out of the window straight away!). I occasionally use OSS DOS XL, or ICD's Sparta DOS (with Ultra Speed I/O Processes). Both of which are compatible with DOS 2.0s.

DOS 2.0s is good for its age (and is a great improvement on DOS 1.0). For many a year now, there has been a long wait for a DOS 2.0s update, something which has multiple compatibility and many new features to help the programmer get the most from his disk based system.

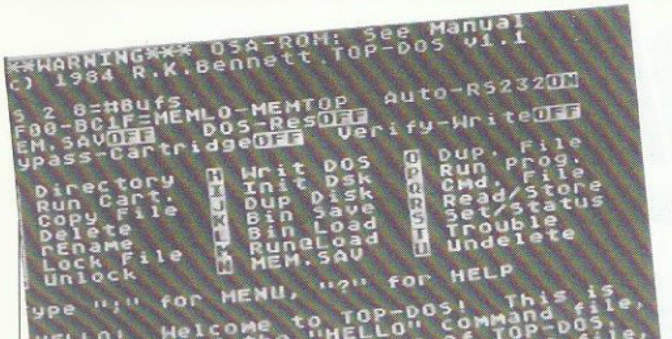
Top-DOS, from Eclipse Software, has done just this. Top-DOS is a menu driven DOS with many more features than Atari DOS 2.0s. I counted 43 more commands. Many are features to help the lazy user, but some are a real help to programmers who need to get the best from their DOS. I shall briefly outline some of the major commands which attracted me to Top-DOS.

The directories are alphabetically listed and numbered for ease of use. You can search a directory for all the files 'beginning with, for example, 'A' and specify to copy them to another disk, print them to printer, or print them to screen. A nice feature which alleviates the necessity of exiting to Basic or Assembler, to load a file to see its coding.

You can specify the length of the file name, and the number of columns in the menu, (1 to 6). A trouble command lets you see an error message in English. No more codes to learn! You can boot the RS232C Handler from DOS, choose Resident DOS, or Non-resident DOS, change bytes in memory using the Editor and Monitor, already installed in memory when Top-DOS is booted, and there is one of my favourite commands, Undelete file.

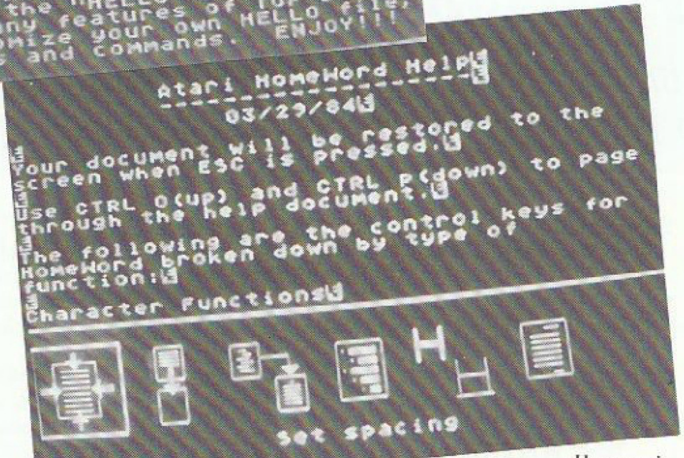
Top-DOS is divided into two parts, the first part being the main menu, which is similar to a DOS 2.0s menu, but with 12 more commands. The second part is a customiser menu with around 22 commands. This customiser menu is a very useful part of the DOS. It allows you to make your own version of DOS, with your own pre-coded requirements. Something similar to that of a Printer coding disk, with all the Printer codes set up for your particular Printe

This customiser section does'nt write codes to the disk however, it makes alterations to the DOS in memory and then



```
*WARNING*** OSA-ROM: See Manual
c) 1984 R.K.Bennett TOP-DOS v1.1

S 2 8=#Bufs                    Auto-RS232ON
F00-BC1F=MEMLO-MEMTOP
EM.SAVOFF    DOS-ResOFF  Verify-WriteOFF
ypass-CartridgeOFF

 Directory    H  Writ DOS    O  Dup. File
 Run Cart.    I  Init Dsk    P  Run Prog.
 Copy File    J  Dup Disk    Q  CMd. File
 Delete       K  Bin Save    R  Read/Store
 rEname       L  Bin Load    S  Set/Status
 Lock File    M  RuneLoad    T  Trouble
 Unlock       N  MEM.SAV     U  Undelete

ype ";" for MENU, "?" for HELP

HELLO!  Welcome to TOP-DOS!  This is
a preview of the "HELLO" command file,
one of the many features of TOP-DOS.
You may customize your own HELLO file,
with messages and commands.    ENJOY!!!
```

TopDOS



```
        Atari HomeWord Help
        -------------------
             03/29/84

Your document will be restored to the
screen when ESC is pressed.

Use CTRL O(up) and CTRL P(down) to page
through the help document.

The following are the control keys for
HomeWord broken down by type of
function:

Character functions
```

Homeword

writes the new modified version out when you are finished. Some of the options available are: Change Resident DOS; Verify write; Single/Double/Quad Density; File Buffers; Drive Control bytes; Bypass Cartridge; Disk Buffers; System Drive Number; Margins; Locations in memory and even change the prompt cursor.

One feature I have not experimented with yet, is the Modify Drive Control bytes. This useful feature can only really be utilised on Percom, Rana, Concord, Trak, and Indus drives. These drives have transferable bytes. Twelve bytes can be modified to support Double Density, Sector Count and other nice features such as Access Times.

Something I enjoyed using was the revised copy option. You can merge copies of files together and save out as a complete file on another disk. Also, I enjoyed the new format feature. Not only can you specify how you want a disk formatted, but you can format a disk in 3 seconds! It does this by cheating a little in that it only formats the VTOC. The formatting range can also be altered (720 is the default) to 934! Top-DOS has its own help feature included (far easier to use than DOS 3.0s) and now contains sub-files. There are only two files that make up Top-DOS; DOS.SYS and DUP.SYS. Top-DOS even has its own AUTORUN.SYS creator called, appropriately, 'HELLO'. Something I am yet to experiment with fully.

Above all, Top-DOS is what I would call the Ultimate DOS. When I first looked at it I thought it was complicated and hard to use, but I was very wrong! There is nothing more simple than operating Top-DOS. I am sure that my personal enthusiasm plays a biased role in this review, but I hope it still gives you some idea of the capabilities of the 'TOP' DOS.

Homeword

48K Disk, Price £54.95
Reviewed by Matthew Tydeman.

Homeword is one of the latest word processors on the market and is somewhat different in appearance to that of many others that are around at the moment. Homeword is supported by a full range of Icons (a small illustrated picture of the performing function). In a sense, Homeword is not menu driven, although text prompt lines accompany each Icon on display. Within the main Icon menu are illustrations of a disk, a printer, a filing cabinet, and writing paper. As you select each Icon, you enter another Icon menu linked with the title chosen, i.e. if you select the filing cabinet menu, you will enter a sub-Icon menu which contains a number of filing cabinets, each with a different function, such as Merge File, Copy File, Erase File, Get File, Save File, etc.

Because of the Icons, the screen is divided into two display regions. The upper half is for editing (only 16 lines) and the lower half is the region in which the Icons are shown and also the memory situation and disk storage situation are graphically represented with bars. In the bottom right hand corner is an 80 column display, each letter being shown on this 'mini' page as a Graphics 8 pixel, even a flashing cursor is included.

Other than these extraordinary functions, Homeword operates like any other word processor, but with a few limitations. Block Delete/Copy, File Search/Replace, Justify, Merge, Include and Move are all there but are hard to access and utilise. Each sub-Icon menu is called from disk in order to save memory space (essential in a word processor), and this calling of each menu from disk takes some time, which tends to prolong completion of the letter/document. Selection of the desired Icon is complicated at times and one false move with the cursor will load the wrong Icon menu.

A feature I did not like much was that the Icons were too extensive, once you entered one Icon menu, you had to go on to another and another and then yet another. This aspect, I feel, makes user friendly operations into frustrating time consuming annoyances, and this is what Icons should'nt be! The main reason for having Icons is to simplify and make things easier, in Homeword's case, for example, sometimes you have to go three or four layers to get back to the main Icon menu. Very upsetting.

A good feature however, is that you can customise your own printer codes to match your printer. Included with the program is the Customiser File, which is quite easy to use. All the editing features are the same as normal screen, as is the ever popular CONTROL and 1 letter formatting, i.e. CONTROL + I sets the page indent. But note that these codes are different from Atariwriter & Letter Perfect (whose codes are similar).

A nice touch is the Preview Document. This is presented differently from the usual preview division in word processors in the sense that it is in full 80 column format. A nice feature to use, but unfortunately it is only in the preview option and not the edit option, still at least you won't have to worry about mistakes as you can see your whole document scroll up the screen just the way it will be printed.

The program would be good for youngsters, they can't really go wrong with the Icons. For those who don't like the idea of Icons, there is a system to cut out all Icon operation. This system just stops cursor control for the selection of Icons, it does not however cut out the different loading processes, it just enables you to key-code instead, i.e. press Control + F for Filing Cabinet.

Of course, when using this key-code method for controlling the Icons, there is inevitably a lot of key-codes to remember. This can be eased by the use of quick reference cards which would have all the codes marked on. All the codes are also stored on the master system diskette, as a printer file, so you cannot really go wrong in this respect.

The overall program instructions are quite extensive, but not very helpful when it comes to problems, which often happens when playing around with the various Icon menus. The program is average when it comes to judgement, it is not really what it is made out to be! Many people have got the impression that the program is along the lines of a full pull-down menu system, this is not the case! But its a pretty good attempt.

An average program for an above average price, something Sierra should think about, I feel. I could not get to grips with this claimed 'Easy to use' word processor. The idea of Icons on an eight bit machine has not really appealed to me. The use of Icons on a sixteen bit micro shall, I'm sure!

GO FORTH

by Paul Blackmore

This article is an introduction to one of the more popular alternatives to BASIC as a programming language

FORTH, as it is generally known today, is based on FORTH 79, the most usual implementation being to the Fig FORTH model. This is a minimum specification, most commercial implementations of FORTH have enhancements to take advantage of a particular computers capabilities. There are a number of different FORTHs for the ATARI, mostly disk based, although English Software have recently produced a cassette version. There are currently three disk versions available, FigFORTH by ATARI (APX) approx. £7, Q.S. FORTH by Quality Software and ValFORTH by Valpar International. As FORTH was designed to operate with disk based systems this article is in general talking about disk versions of the language.

FORTH Advantages?

Firstly, FORTH is significantly faster than BASIC in most applications. This is because FORTH source code is compiled and not interpreted at run time (this is not strictly true as FORTH has a small run time interpreter). Secondly, FORTH code is compact, allowing larger programs in the available memory. A FORTH word, once defined, takes only two bytes of memory when subsequently used inside another word definition.

What is FORTH?

The most fundemental structure in FORTH is the stack. Anyone who has delved into the intricacies of assembly language will understand the concept of the stack. For the uninitiated, the stack can be likened to a pile of papers, each sheet of paper in the pile having an item of data written on it. Obviously the last sheet put on the pile is the first one to be taken off the top, commonly known as LIFO (last in, first out), and to get at something halfway down the pile you have to move the others off the top first.

One of the most apparent differences between FORTH and other languages is the use of Reverse Polish Notation (RPN). This is usually one of the earliest stumbling blocks when learning FORTH. To my knowledge, no other language uses RPN, although some of you may know it from some of the early scientific calculators. Basically it works in this manner.

On a normal calculator, the calculation: –
6(5+(4*3))=

Would entail a series of keystrokes something like this: –
4 * 3 = + 5 = * 6 =

In FORTH, this calculation becomes: – 6 5 4 3 * + * .

The '.' in FORTH, the print stack command, is the equivalent of hitting the equals key on the calculator.

The top two numbers on the stack (3 & 4) are multiplied by the first '*' leaving the result on the top of the stack. The '+' then takes this result and adds it with the next number down the stack, the 5, and leaves the result of that calculation on the stack. Finally, the '*' takes these two remaining numbers and multiplies them together. The last operator, the '.', prints the number left on the top of the stack.

It can be seen from this example that the stack can be loaded with data and then each item of data can be accessed sequentally by the mathematical operators. There are many commands within FORTH that allow manipulation of data on the stack so that extremely complicated calculations can be performed without vast numbers of brackets, in fact without the use of brackets at all!

This brings me to FORTH's most powerful feature, the ability to define your own command words. The words that you define can then in turn define other words which ultimately becomes your program. There is almost no limitation on what words do or even on what they are called, (you cannot have a word with a space in its name or certain control characters).
In fact, some of the standard words in FORTH are nothing more than symbols, e.g. @!-–> etc.

For instance, you could define the word 'AVERAGE' to calculate the average of three numbers. It could look something like this: –
:AVERAGE + + 3 / . ;

The ':' and the ';' mark the start and finish of a word definition. This word needs three numbers on the stack, it adds them together, divides by three and prints the result. It would be used in the form: –
99 338 225 AVERAGE

This would print the result '220 Ok.' (the 'Ok.' is like BASIC printing READY).

Note that the result is 'integer only', i.e. there are no decimal places in the answer. With a different definition of AVERAGE it is possible to get an answer with a remainder: –
:AVERAGE + + 3 /MOD . . . " / 3" ;

The ." " prints the text between the quotes. This would print the result: –
99 338 225 AVERAGE 220 2 / 3 Ok.

Standard FigFORTH does not support floating point maths. If you have ATARI's FigFORTH or ValFORTH however, this has been added as an extension to the system. It should be noted that the use of floating point maths in FORTH is not much quicker than it is in BASIC, it uses the same OS routines!

The FORTH command words available allow you to have the very fashionable 'structured programming'. Apart from words that allow manipulation of memory there are loops such as DO– –LOOP, DO– –+LOOP, conditional structures like IF– –ENDIF, IF– –ELSE– –ENDIF, BEGIN– –AGAIN, BEGIN– –UNTIL, BEGIN– –WHILE– –REPEAT, and the extremely powerful <BUILDS– –DOES> construct. With <BUILDS– –DOES> words can be created that define defining words (read that again, it does make sense!).

In ATARI FORTHs there are command words on the system disk for graphics, sound, printer handling, an editor and a complete assembler vocabulary allowing the use of assembly language in a FORTH program. ATARI's FigFORTH and ValFORTH also support RS232 interfaces, DOS I/O and floating point maths.

Writing a FORTH Program

Writing a FORTH program can be done in two ways. You could, as in the case of the short examples given here, just type them into the FORTH dictionary directly from the screen editor. Alternatively the better way, especially when the word definitions are large, is to use the FORTH editor to write 'screens' for later compilation. In fact this is the only way that you can save your word definitions for later modification, unless you save the complete FORTH system containing the new words.

The standard FigFORTH editor is

perhaps FORTH's most notorious feature, it is not as easy to use as the standard full screen editor used by BASIC. Some versions of FORTH have tried to remedy this, notably Q.S. FORTH, and provided an editor more like the one we are all used to. Unfortunately, most people have to use the RAGSDALE editor provided, (which incidentally is written in FORTH), unless you wish to write your own editor of course!

Standard ATARI FigFORTH works by treating the disk as blocks of 'virtual memory'. This means that FORTH sees a single density disk as 90 external blocks of 1K memory. Other versions of FORTH use smaller size blocks, usally 1/2K per screen. This allows more screens per disk and also saves on wasted disk space. Once you have written your program onto these screens using the editor you can 'LOAD' them onto the FORTH dictionary using: – 10 LOAD(remember, everthing is backwards!)

The 'program' written on screen 10 will be taken off the disk and compiled into the dictionary. If screen 10 ends with the load next screen command, – – >, then screen 11 will also be loaded and compiled. When all this has finished, your command words will be in the dictionary and can be listed with list vocabulary command, VLIST. Your program can now be run, just type its name!

Dictionaries & Vocabularies

You may have noticed that I have been talking about dictionaries and vocabularies and have not explained what they are. Well a dictionary is a list of words (surprise, surprise!) found in a vocabulary. To explain, the words found in a French dictionary are the words in the French 'vocabulary', i.e. the French language. The same thing applies in FORTH. The words in a FORTH dictionary are the words that FORTH can understand, if you change the vocabulary to something else, e.g. ASSEMBLER, then the vocabularies are a bit smarter than this, everything defined in a vocabulary will eventually trace back to the FORTH vocabulary, the words are effectively translated for you by the system. What this means is that if an application does not have a word defined in the CURRENT vocabulary then FORTH will trace back and try to find it in the FORTH vocabulary.

To illustrate the use of vocabularies, suppose that FORTH is the 'CURRENT' vocabulary, i.e. the one that we are compiling our word definitions into, we could define a word to tell us which vocabulary we are working in, thus: –
:WHERE ." defining into FORTH" ;

Now we create a new vocabulary and set it to be the current vocabulary by typing: – PROGRAM DEFINITIONS

From now on all new word definitions will go into the PROGRAM vocabulary. If we redefine WHERE thus: –
:WHERE ." Defining into PROGRAM" ;

A message 'WHERE is not unique' is printed because the system knows about the definition of WHERE that we just put into the FORTH vocabulary. If we now type: – WHERE

We get the message 'Defining into PROGRAM'. Now type:
FORTH DEFINITIONS
WHERE

We get the message 'Defining into FORTH'. The uses for vocabularies are endless, you could write adventures, telephone and mailing lists, language translators, database systems, word processors or even disk operating systems all based around the use of different vocabularies.

Of necessity, this article has not been too technical, nor attempted to teach FORTH programming, but I hope that it has at least given you an insight to the possibilities of using an alternative language like FORTH.

A final word of caution to all possible converts, because of its total flexibility, FORTH can be quite hostile to programmers with 'untidy minds'. The lesson is: forget all those nasty little habits you used to get away with in BASIC and learn the correct way of doing things!

Starting from Basics
Continued from page 9.

A), if you type a non – numeric string, such as a name (or even in fact by pressing the RETURN key with no number) BASIC will give an error (ERROR 8 – INPUT STATEMENT ERROR) and your program will stop.

```
10 DIM C$(20),S$(20)
20 PRINT "CHRISTIAN NAME";:INPUT C$
30 PRINT "SURNAME";:INPUT S$
40 PRINT "AGE";:INPUT A
50 PRINT
60 PRINT "YOU ARE ";C$;" ";S$
70 PRINT "YOUR AGE IS ";A;" YEARS"
80 PRINT "(ROUGHLY ";A*365;" DAYS!)"
90 PRINT :PRINT
100 GOTO 20
```

Type NEW and enter the above program then type RUN. Answer the questions. Notice how I have used a semi-colon after the PRINT commands that give the prompt for the following INPUT command (e.g. on line 20). This is so that the cursor remains on the line, immediatly after the prompt. If you wanted the INPUT command to continue on the next line you would omit the semi-colon. Remove the semi-colon on line 20 and see how this changes the way the program works.

Suppose that you decide that you want to insert another program line between lines 60 and 70. Now you should see the advantage in using line number references in increments of 10, for you can simply enter your new line as number 65, the computer will then insert it between lines 60 and 70 in its memory. Try typing the following line: –

```
65 PRINT "INITIALS ARE ";C$(1,1); S$(1,1)
```

Now, RUN the program again and you will see that the extra line does indeed print your initials on the screen. Type LIST to see that the new line is placed in the correct position.

Using LIST

The command LIST can be used in several ways. You have seen that LIST, when used on its own, will cause the computer to list your entire program to the screen. This is great for small programs, but suppose that you are altering a line in the middle of a large program, you would have to wait patiently while the computer lists all the way through, until it reached the line you want. There is, however, a much more convenient way of looking at a single line, you simply type LIST 90 to list line 90. You can even list sections of a program if you wish, by simply typing (for example) LIST 50,80. This would list every line between (and including) 50 and 80.

LIST can also be used to any other device you have. For example, to list to a printer you would type LIST "P:" or LIST "P:", 50,80 for lines 50 to 80 only.

And Finally

If you are running a program which prints lots of data to the screen, or you are listing a long program to the screen, it is possible to 'freeze' the screen to give you time to read it. You do this by holding down the CONTROL key (on the far left of your keyboard) whilst you press the '1' key. The computer will instantly stop in its tracks and this gives you time to read the display. You tell it to continue by repeating the process. This only works whilst data is being printed to the screen – not with any other devices such as printers.

A useful feature of Atari BASIC is that virtually all of its commands can be abbreviated. For example, the command GRAPHICS 8 can be replaced with GR.8, and GOTO 10 can be replaced with G.10. If you take a look at the manual supplied with your computer, you will see the abbreviated version next to each command. Try experimenting with them. Notice that, although you may enter your program line using the abbreviations, when you actually LIST the program BASIC prints the full version! There is however, one exception to this. The command PRINT has a special abbreviation which stays in its short form when you LIST the program, it is the question mark (?). Try some of the programs again, but this time use the question mark in place of PRINT.

That's all for now, but I will be back in the next issue to continue with our lessons. See you all again soon!

A RAMDISK FOR THE 130XE

by Ron Levy

Atari (US) have released a version of DOS (called DOS 2.5) which contains a RAMDISK, taking advantage of the 130XE's extra 64K of RAM. Soon it will be freely available to users, but until that time, presented here is a short program which sits in page 6 of memory, and which intercepts calls to drive 2 and instead of getting or putting a sector to drive 2 it transfers the data to the extra 64K of memory (the DOS 2.5 Ramdisk will access drive 8 – Ed.). The result is an incredible increase in speed when loading and saving programs or when working with files on the Ramdisk. Just like normal memory, however, the extra memory is lost when you switch off the computer, so you must remember to copy all your files back to a real disk drive when you are finished. However, since the Ramdisk only has 64K, you will only be able to use up to sector 512 rather than the usual 709 (DOS 2.5 only allows access to 499 sectors).

I use K-DOS rather than DOS 2, so this Ramdisk was originally intended to be used with K-DOS, but I have also included a patch to allow it to work with DOS 2. Using DOS 2 it is possible to configure the Ramdisk as drive 1, and then write DOS files to it. Then, if you are using BASIC and want to go to DOS, you type DOS as usual, but now the DOS menu will be loaded well within 1 second, a startling speed!

CREATING THE RAMDISK

The first task is to type in and RUN the BASIC program, Listing 1. This creates a file on your disk, named 'RAMDISK.OBJ'. This file is a BINARY LOAD file, and it contains the main Ramdisk program. The same program will work for both K-DOS and DOS 2, and it will load onto the bottom half of page 6, so it does not conflict with the operating system. It won't however, work on its own, since DOS will not use it, we now have to alter our DOS to make it call our routine before it transfers sectors of data to and from disk.

For disk sector transfers, both versions of DOS use a routine in the first part of DOS. This routine calls the serial bus routine in the operating system with a JSR $E459 instruction, but we must change this to point to our routine with a JSR $600. This simply involves changing the two appropriate bytes, and in DOS 2 these are locations $7A3 and $7A4 (decimal 1955 and 1956). The locations in K-DOS are $7AD and $7AE (decimal 1965 and 1966). The contents of these two bytes must be changed to 0 and 6 respectively. Although these locations can be altered using BASIC, by far the quickest way is to have a further binary load file, and consequently I have included a program to create such a file for you. Program 2 is for use with DOS 2, and program 3 for K-DOS. Each will create a binary load file named 'PATCH.OBJ'.

```
KF 1 REM ..........Program 1...........
IN 2 REM This program creates a binary
BT 3 REM load file called RAMDISK.OBJ
SV 4 REM This will be the main ramdisk
SP 5 REM program and it lives in page 6
NL 6 REM
JQ 10 OPEN #1,8,0,"D:RAMDISK.OBJ"
KM 20 TRAP 200
IL 100 READ X:PUT #1,X:GOTO 100
KY 200 CLOSE #1
HC 210 PRINT "Complete."
TJ 300 STOP
FO 1001 DATA 255,255,0,6,140,6,173,1,3,20
   1,2,240,4,32,89,228,96,173,10,3,133,21
   2,173,11,3,133,213,41,254,208,77,173
KJ 1002 DATA 4,3,133,214,173,5,3,133,215,
   32,108,6,32,125,6,160,127,173,2,3,201,
   82,208,22,166,218,142,1,211,177,216
WL 1003 DATA 162,241,142,1,211,145,214,13
   6,16,239,160,1,76,102,6,201,80,240,4,2
   01,87,208,22,177,214,166,218,142,1
WI 1004 DATA 211,145,216,162,241,142,1,21
   1,136,16,239,169,1,76,102,6,160,1,140,
   3,3,96,165,213,106,165,212,41,128,106
NQ 1005 DATA 74,74,74,74,9,225,133,218,96
   ,165,212,24,41,127,106,9,64,133,217,16
   9,0,106,133,216,96
```

USING WITH DOS 2

Boot up your 130XE with the DOS 2 MASTER DISKETTE, (you must leave BASIC installed, and type DOS to go to menu). Insert a fresh diskette and use option I to format it, then use H to write DOS files to it. Now return to BASIC (option B).

Type in and SAVE program 1, then RUN it. This will create the file 'RAMDISK.OBJ'. Now type in and RUN program 2, which will create 'PATCH.OBJ', the file that will overlay and 'steal' the serial interface vector in DOS. You must now return to the DOS menu using the command DOS. When the menu appears type L for BINARY LOAD. The computer will ask for a file name, and you should enter RAMDISK.OBJ. Now repeat the process for the file PATCH.OBJ. You now have a Ramdisk in your system, set up as drive 2. As with a normal disk, the first thing you must do is to format disk 2, using option I. At this stage you can even look at the directory of the Ramdisk, which will of course show 709 free sectors, although you are only able to use up to 512 sectors. How you use your Ramdisk depends upon the tasks you need to perform, but you could now return to BASIC, and LOAD programs from drive 1, and SAVE them to drive 2. If you are developing your own programs you could use the Ramdisk to store any utility routines or files that you use regularly, and the easiest way of doing this is to use the file copy facility (option C) on the DOS menu. The best way of doing this is to create a normal disk full of your utility routines and programs, and copy them to the Ramdisk using the copy facility with wildcards for the filenames, e.g. D1:*.*,D2:*.*

```
KG 1 REM .........Program 2...........
IN 2 REM This program creates a binary
NH 3 REM load file called PATCH.OBJ
XK 4 REM to force DOS 2 to call the
OM 5 REM ramdisk routine.
NL 6 REM
WJ 10 OPEN #1,8,0,"D:PATCH.OBJ"
KM 20 TRAP 200
IL 100 READ X:PUT #1,X:GOTO 100
KY 200 CLOSE #1
HC 210 PRINT "Complete."
TJ 300 STOP
DQ 1001 DATA 255,255,163,7,164,7,0,6
```

Another way of using the Ramdisk is to configure it as drive 1, then format and write DOS files to it. This way you can flip between BASIC and DOS at incredible speed. In fact, even when you use a MEM.SAV file DOS will appear within 1 second!

```
LE 1 REM .........Program 3...........
IN 2 REM This program creates a binary
NH 3 REM load file called PATCH.OBJ
CV 4 REM to force K-DOS to call the
OM 5 REM ramdisk routine.
NL 6 REM
WJ 10 OPEN #1,8,0,"D:PATCH.OBJ"
KM 20 TRAP 200
IL 100 READ X:PUT #1,X:GOTO 100
KY 200 CLOSE #1
HC 210 PRINT "Complete."
TJ 300 STOP
QK 1001 DATA 255,255,173,7,174,7,0,6
```

Unfortunately though, as the program stands you cannot write DOS files to drive 2 and then convert the Ramdisk to respond as drive 1 since DOS does a status check on the drive via a different route first. Consequently, I have included program 4, which will provide you with yet another binary load file. This file, when loaded with option L, will perform the equivalent of a POKE 1540,X where X represents the number we want our Ramdisk to respond to. Once you have changed the Ramdisk to drive 1, you can write DOS files to it (option H), and then return to BASIC. You would then probably want to switch your normal disk drive to respond as drive 2.

USING RAMDISK WITH K-DOS

The method here is essentially the same, except for a few points which I shall explain. Run program 1 as normal, but instead of program 2, use program 3. There is no need to write DOS files to the Ramdisk since, with K-DOS, the utilities package is permanently in memory. K-DOS performs a check on the destination location of binary load files to ensure that you do not accidentally corrupt DOS, so to force our patch file in, you must use the /PUT switch thus: –
LOAD PATCH.OBJ/P

The DISKDUP.SYS program supplied with K-DOS, will not work with the Ramdisk unless a small modification is made.

```
MC 1 REM .........Program 4...........
IN 2 REM This program creates a binary
KX 3 REM load file called DRIVE1.OBJ
ZQ 4 REM to be used to change the
BX 5 REM ramdisk to make it respond
EQ 6 REM as drive 1.
NM 7 REM
JY 10 OPEN #1,8,0,"D:DRIVE1.OBJ"
KM 20 TRAP 200
IL 100 READ X:PUT #1,X:GOTO 100
KY 200 CLOSE #1
HC 210 PRINT "Complete."
TJ 300 STOP
ZE 1001 DATA 255,255,4,6,4,6,1
```

First, insert a K-DOS master disk with DISKDUP.SYS on it and go to DOS.
Type: – LOAD DISKDUP.SYS/M
Then: –
A 42DE A9
A 42DF 01
A 42E0 EA
SAVE DISKDUP.RAM 4000 47C0 4000

You will now have created the disk file named DISKDUP.RAM, which you call with the command,
RUN DISKDUP.RAM

Or, if you copy it to your Ramdisk: –
RUN D2:DISKDUP.RAM.

Although K-DOS features abbreviated commands, I have shown them in full to ensure clarity.

```
10 ; ****************************
20 ; *         RAM-DISK         *
30 ; *  A Virtual Disk Storage  *
40 ; *  System Which Uses The   *
50 ; *  Extended RAM Facility   *
60 ; *    On The ATARI 130XE    *
70 ; *       BY RON LEVY        *
80 ; ****************************
0100 ;
0110 ;   Disk Interface Equates.
0120 ;
0125 SIOV    =$E459
0126 DDEVIC  =$300
0130 DUNIT   =$301
0140 DCOMND  =$302
0150 DSTATS  =$303
0160 DBUFLO  =$304
0170 DBUFHI  =$305
0180 DAUX1   =$30A
0190 DAUX2   =$30B
0200 GETSEC  =$52
0210 PUTSEC  =$50
0220 FORMAT  =$21
0300 RAMCTL  =$D301
0310 T1      =$D4
0320 T2      =$D5
0330 T3      =$D6
0340 T4      =$D7
0350 BPL     =$D8  RAM block position
0360 BPH     =$D9 for a given sector.
0370 RAMSEL  =$DA   Bank select mask.
0400 NORMAL  =241  'Normal' RAM MASK.
1000         *=$600
1010 BEGIN
1020         LDA DUNIT  Check the
1030         CMP #$02   drive number.
1040         BEQ B1
1050         JSR SIOV  Go to SIOV if
1060         RTS    its not for RAM.
1070 ;
2000 ;
2010 ; Main routines here. ;
2020 ;
2160 ;
2170 B1
2180         LDA DAUX1  Transfer the
2190         STA T1    sector number.
2200         LDA DAUX2
2210         STA T2
2212         AND #254   Check for
2214 ;                 sector number
2216 ;                     too high.
2218         BNE EXIT
2220 B2
2230         LDA DBUFLO Transfer the
2240         STA T3        buffer
2250         LDA DBUFHI      pointer.
2260         STA T4
2270 ;
2280         JSR RAMBANK
2290         JSR RAMPOS
2295         LDY #127
2300 ;
2310         LDA DCOMND
2320         CMP #GETSEC
2330         BNE PUT
340 ;
2350 GET
2360 ;                  The GET sector
2362 G1      LDX RAMSEL     command
2364         STX RAMCTL       routine.
2370         LDA (BPL),Y
2372         LDX #NORMAL
2374         STX RAMCTL
2380         STA (T3),Y
2390         DEY
2400         BPL G1
2405         LDY #$01
2410         JMP EXIT    Done !!
2420 ;
2430 PUT
2440         CMP #PUTSEC
2450         BEQ P1
2452         CMP #$57
2454         BNE EXIT
2460 ;
2500 ;                  The PUT sector
2510 P1      LDA (T3),Y      command
2512         LDX RAMSEL       routine.
2514         STX RAMCTL
2520         STA (BPL),Y
2522         LDX #NORMAL
2524         STX RAMCTL
2530         DEY
2540         BPL P1
2542         LDA #$01
2550         JMP EXIT     Done !!
2590 ;
2599 ;
5000 EXIT
5010         LDY #$01
5020         STY DSTATS
5090         RTS    Done and Bye !!!
9000 ;
9010 ; Select A RAM Bank. ;
9020 ; T1 = low  ;  T2 = high
9030 RAMBANK
9040         LDA T2  The high byte.
9050         ROR A
9060         LDA T1  The low byte.
9070         AND #128
9090         ROR A
9100         LSR A
9110         LSR A
9120         LSR A
9130         LSR A
9140         ORA #225 Set other bits.
9150         STA RAMSEL
9190         RTS          Done !!
9198 ;
9199 ;
9200 ;
9210 ; Calculate the data block
9220 ; position in RAM.
9230 RAMPOS
9240         LDA T1  Sector low byte.
9245         CLC
9250         AND #127
9260         ROR A
9265         ORA #64
9270         STA BPH
9280         LDA #$00
9290         ROR A
9300         STA BPL
9310         RTS          Done !!
9390 ;
9399 ;
```

KEYO KEYO KEYO KEYO KEYO

The Ultimate Checksum Program

by Eddie Taw

By far the most frequent comment made to us by readers of Monitor is 'Why don't you have some kind of program entry checker to help us type in your listings?'. Well, never let it be said that we would ignore such a regular request from our readers, so here is KEYO!

You may have noticed that in this issue each listing has a two character code before each line number. This is the checksum code which KEYO will use to determine whether or not you have typed the program line correctly. You might also notice that it is similar to the checksum letters used in several other magazines. In fact, you can actually use our program to enter the listings in those magazines, or perhaps use their checksum program to enter the programs in MONITOR, if you prefer!

What makes KEYO different?

KEYO works by saving your program onto cassette or disk as you enter it at your keyboard. It also asks you for the checksum code for each line and compares this to the line you have just entered. We feel that KEYO offers several advantages over other checksum entry utilities:—

a) Since KEYO requires you to enter the given checksum code as well as the line, and rejects the line if it does not match, there is no danger of you getting a wrong line as there could be if you had to check every code yourself.

b) Since KEYO saves to cassette or disk as you type, if the computer crashes for some reason (e.g. the wife/sister/brother unplugs your computer to use the hoover!) then don't worry, you will only lose a very tiny part of the program you have entered (128 characters at the very most).

We hope that you find KEYO helpfull but PLEASE remember that we would like to know of any difficulties you encounter whilst using it, or indeed any improvements you think we could incorporate. Feedback from users is of vital importance if we are to improve the service to you, our readers.

```
EI 1 REM ********************************
NH 2 REM
TI 3 REM KEYO
NJ 4 REM
UG 5 REM BY EDDIE TAW
NL 6 REM
YN 7 REM FOR MONITOR MAGAZINE
NN 8 REM
EQ 9 REM ********************************
RT 10 DIM C$(2),CHK$(3),F$(15),L$(132)
GX 20 ? CHR$(125);"  KEYO Handityper  --
   By Eddie Taw. "
KI 30 ? "         For MONITOR Magazine."
VF 40 PRINT :PRINT
QB 50 ? "Do you want Instructions Y/N ";:
   INPUT L$:IF L$="Y" THEN GOSUB 10000
YJ 100 ? "Output file ";:INPUT F$:IF F$(1
   ,1)="I" THEN 50
XC 120 IF F$(1,1)="C" THEN ? "Insert TAPE
    and press RECORD & PLAY"
XB 200 OPEN #1,8,0,F$
ES 210 IF F$(1,1)="C" THEN FOR I=1 TO 130
   :L$(I,I)=CHR$(32):NEXT I:PRINT #1;L$
VQ 220 SOUND 0,0,0,0
VW 300 ? "Type the CODE...";:INPUT CHK$
UW 310 IF CHK$="END" THEN CLOSE #1:GOTO 3
   2767
ZK 320 IF CHK$="I" THEN GOSUB 10000:GOTO
   300
QU 400 PRINT "Type the PROGRAM line,"
MZ 420 POKE 85,0:? CHK$:POKE 85,1
IT 430 INPUT L$:IF L$="" THEN 300
NO 440 IF L$(1,1)="C" THEN 300
SS 450 IF L$="I" THEN GOSUB 10000:GOTO 40
   0
SP 460 GOSUB 5000
VP 470 IF CHK$=C$ THEN PRINT #1;L$:PRINT
   "Ok. Line accepted.":PRINT :SOUND 0,0,
   0,0:GOTO 300
QE 500 REM Error Routine.
OY 510 ? "Error ; Re-type program line."
YN 520 ? CHR$(253);:POKE 85,0
ZZ 530 ? CHK$:X=PEEK(84):? L$:POKE 84,X
JK 540 POKE 85,1
OF 550 GOTO 430
HP 5000 REM ...Calculate The Checksum...
XH 5010 S=0
FF 5100 FOR I=1 TO LEN(L$):S=S+I*ASC(L$(I
   ,I)):NEXT I
CE 5110 C=S-676*INT(S/676):HC=INT(C/26)
KQ 5120 LC=C-(HC*26)+65:HC=HC+65
YH 5130 C$(1)=CHR$(HC):C$(2)=CHR$(LC)
AV 5900 RETURN
BC 10000 REM
KI 10010 FOR J=1 TO 4
KM 10020 GOSUB 11000:POSITION 2,4
PV 10030 ? "Instructions."
WK 10040 ? "-------------"
HP 10050 RESTORE 10100+J*100
UP 10060 FOR I=1 TO 14
EF 10070 READ L$:PRINT L$
GP 10080 NEXT I
GL 10090 ? :POKE 85,4:? "Press RETURN to
   continue...";:INPUT L$:NEXT J
FT 10100 GOSUB 11000:RETURN
JI 10200 DATA ,  KEYO will save your prog
   ram as,it is typed in so first it must
    ask
SP 10210 DATA where you want it saved to.
    It will,give the prompt 'Output Filen
   ame ?'
RR 10220 DATA ,  Cassette owners will typ
   e C: and,must then place a good qualit
   y tape
WH 10230 DATA into their recorder (prefer
   ably C60),and press the RECORD & PLAY
   buttons.
SZ 10240 DATA ,  Disk drive owners need t
   o specify,a filename (ie D:PROG.LST) a
   nd then,insert a good disk.
US 10300 DATA ,  KEYO will first ask you
   for the,two character code which you w
   ill,find next to each program line.
CX 10310 DATA ,  Next it will ask for the
    program,line. If you wish to go back
   to the
RD 10320 DATA previous prompt just press
   RETURN,on its own.  KEYO will check th
   e,line and save it if it is corrrect.
AX 10330 DATA If it is incorrect you will
    be able,to edit it or type C to chang
   e the
RC 10340 DATA code (you can type over the
    line).,
DZ 10400 DATA ,  To leave the program at
   any time,you simply type END when KEYO
    asks,for a checksum code.
SH 10410 DATA ,  You can continue enterin
   g your,program later by again RUNning
   KEYO.
SN 10420 DATA Casstette owners simply lea
   ve their,tape in the player so that KE
   YO can
YK 10430 DATA create another file immedia
   tely after,the first but disk drive ow
   ners will
GD 10440 DATA have to give a different fi
   lename,(eg PROG2.LST).,,
MS 10500 DATA ,  To load the finished pro
   gram:-,,  CASSETTE owners must first r
   ewind
GH 10510 DATA the tape and type NEW to er
   ase the,KEYO program. Then type ENTER
   "C:"
IG 10520 DATA for as many times as you EN
   Ded and re-ran KEYO.,,  DISK DRIVE own
   ers should follow
HY 10530 DATA a similar sequence except t
   hat you,must type ENTER "D:PROG1.LST"
   and
XA 10540 DATA repeat this for any other f
   ilenames,you have used.,
BE 11000 REM
MB 11010 POSITION 2,3
RV 11020 FOR I=1 TO 20
HX 11030 PRINT CHR$(157);
CB 11040 NEXT I:RETURN
AO 32767 END
```

USER GROUP SOFTWARE

Software Librarian - Roy Smith

Due to demand from members there are now two ways to get programs from the library. The original scheme of exchanging '3 for 1' will still apply, but now with an added bonus. So the library rules have been extended to enable those members who cannot write their own programs to gain access, and those that can to have a possibility of some reward for their efforts. The extended library rules are as follows:

3 FOR 1 EXCHANGE

1. Every program you donate to the library entitles you to three programs in return.
2. The program you donate must be your original and not copied.
3. Your donated program must be submitted on a cassette or a disk, programs in the form of print-outs will not be processed.
4. If your program requires any special instructions they should be added in the form of REM statements within the program (or you may present them as instructions when the program is actually run).
5. BONUS. Every program donated per quarter (between issues of the newsletter) will be eligible to be judged 'STAR PROGRAM' for that quarter. This carries a prize of £10 which will be paid to the author from the club funds. The programs will be judged by the Editorial Team and their decision will be final. The Editorial Team are not eligible for the prize.
6. The '3 FOR 1' exchange is only open to club members.

DONATION SCHEME

1. Every club member will be entitled to ask for up to 3 programs per quarter from the library by donating to the club funds.
2. If a member does not take his/her entitlement for a particular quarter, it cannot be carried forward to the next quarter.
3. A member can have more than one quarter's entitlement at one time (up to a maximum of 12 programs (1 year)), but then will be unable to ask for more until his/her credit quarters have been used. Note that odd numbers of programs will be counted in quarters, i.e. if a member asks for 5 programs, the first 3 will be that quarter's entitlement, the next 2 will be the second quarter's entitlement and he/she will have to wait until the third quarter before he/she is entitiled to any more. Also note that having programs in advance will only be allowed if that member's membership covers the advance quarters.
4. The donation fee will be £1 per program and is not refundable. Cheques and Postal Orders are to be made out to the 'U.K. Atari Computer Owners Club'.
5. Members must send in a blank cassette or diskette for the chosen programs to be recorded on.
6. The 'DONATION SCHEME' is only open to club members.

Finally I would like to point out that some people omit to include return postage when donating to the library, so please do not forget to include 30p worth of stamps to cover this.

THE LIBRARY SOFTWARE SERVICE IS FOR MEMBERS ONLY

LIBRARY SOFTWARE TITLES

Listed below are the software titles received by members for inclusion in the library since issue eight was published. As the library now contains over 300 programs it is getting a bit too large to keep on printing the entire list. Eventually it would probably take over the whole magazine and there would be no room left for the articles and program listings. For those of you who are new members and do not know what is available from the library then send for a photocopy of the complete list which is available from the librarian. There is a small charge for this service to cover photocopying costs. If you would like a list please send 50p and a SAE for return.

Games

ASTERIOD BATTLE
by Mark Hutchinson – Belfast.
Pinball game created using Pinball Constructor.
Runs in 48K min. Disk only.
Not XL compatible.

★★★★ STAR PROGRAM ★★★★

CHASE
by Grahame Fairall – Oxon.
Collect the money but don't get caught. Excellent game with 40 levels of play.
Runs in 32K min. Disk only.

DROPOUT
by Alan Williamson – Dunfermline.
Shoot the dropping objects before they land, or else!
Runs in 16K Cassette or 32K Disk min.

FURTRADER
by Grahame Fairall – Oxon.
Trade your furs, make money or starve. Strategy game.
Runs in 16K Cassette or Disk min.

HAUNTED HOUSE.
by Mark Hutchinson – Belfast.
Pinball game created using Pinball Constructor.
Runs in 48K min. Disk only.
Not XL compatible.

MOTORMAZE
by Mike Barnard – Guisborough.
Drive your bike around the maze to find the exit.
Runs in 32K min. Disk only.
ACTION! program (ACTION! cartridge required).

NUMBER GRID
by Chris Simon – Mold.
Two player game, get the highest score by your quick reactions.
Runs in 32K Cassette or Disk min.

SUPER FRUIT MACHINE 2
by Grahame Fairall – Oxon.
Excellent graphics with all the usual features of a fruit machine.
Runs in 16K Cassette or 32K Disk min.

UPS & DOWNS
by Stephen Taylor – London.
Two player board game. Get your ship or car to the top first collecting bonuses on the way. Good graphics.
Runs in 32K Cassette or 48K Disk min.

Home Entertainment

BLOCKBUSTERS KIT
by Steve Tullett – Dalkeith.
3 person game simulating the score board of the TV Blockbusters game.
Runs in 32K Cassette or Disk min.

MICRO PUZZLER
by Stuart Mowles – Ipswich.
This program takes any of 13 Micropainter pictures and jumbles them into a jigsaw puzzle.
Runs in 48K min. Disk only.
Requires both sides of a disk.

PONTOON FRUIT
by Grahame Fairall – Oxon.
Fruit machine game.
Runs in 16K Cassette or Disk min.

WORDCLUE
by Alan & David Williamson – Dunfermline.
Word guessing game for 1 or 2 players.
Runs in 16K Cassette or 32K Disk min.

Utilities

ATTENUATORS
by Robert Macleod – Glasgow.
This program works out T-network & PI-network attenuator values.
Runs in 16K Cassette or 32K Disk min.

CASSETTE INLAY PRINTER
by Stephen Taylor – London.
Print cassette inlays on your 1020 printer.
Runs in 16K Cassette or Disk min.

COMPOSED WRITER
by Larry Farmer – U.S.A.
Extensive wordprocessor with full on screen editing, print options and many other good features.
Runs in 16K min. Disk only.
Requires whole side of disk.
From ACE of Eugene, Oregon, U.S.A.

COPYDISK
by Robert Gibbons – Holmes Chapel.
Sector by sector disk copy utility (not protected disks).
Runs in 48K min. Disk only.

DISASSEMBLER
by Mike Barnard – Guisborough.
Useful utility for the more advanced programmer.
Runs in 32K min. Disk only.
ACTION! program (ACTION! cartridge required).

MULTIBOOT BOOTBASE
by Sol Negrine – Hockley.
This program reads the directory of multiboot disks and can create a file directory and/or print labels, compatible with APX Proglib.
Runs in 48K min. Disk only.

SCREENBASED WORDPROCESSOR
by Jeff Davies – Llandeilo.
Simple wordprocessor utility, includes Edit, Store & Recall and Print options.
Runs in 16K Cassette or Disk min.

SEARCH & SEARCH 1
by J. Bennett – Newcastle.
Two programs which both look for an ATASCII string on a disk. SEARCH lists the sectors where the string is found, SEARCH 1 displays the section of the sector upto the occurrence of the string.
Runs in 16K min. Disk only.

822 GR.0 SCREENDUMP
by Jeff Davies – Llandeilo.
List the screen to the 822 Thermal Printer.
Runs in 16K Cassette or Disk min.

Education

INTERFERENCE WAVES
by David Cheung – London.
Demonstration of the interference pattern produced when waves meet.
Runs in 16K Cassette or 32K Disk min.

SAMSPELL
by Phil Brown – Newquay.
Spelling and pronunciation program for youngsters. SAM required.
Runs in 48K min. Disk only.

SINE/COSINE CURVES
by Steven Pearsall – Birmingham.
Two programs, one showing the sine/cosine of X, the other showing the variable X.
Runs in 16K Cassette or 32K Disk min.

Music

SIX TUNES
by Grahame Fairall – Oxon.
6 Atari Music Composer Cartridge tunes: Sweet Georgia Brown, From Russia with Love, Skaters Waltz, When I'm 64, If I Could Teach the World, Onedin Line.
Runs in 16K Cassette or Disk min.

PUFF THE MAGIC DRAGON
by Grahame Fairall – Oxon.
Well known tune from Basic.
Runs in 16K Cassette or Disk min.

CRACKING THE CODE

by Keith Mayhew Part Five

Having covered a lot of basic ground work, the previous articles should be used as reference material. Binary and hex numbers were introduced, as well as some binary arithmetic, such as the addition of two numbers. The rest concentrated on the programmer's model of the computer - consisting of external memory and a central processor. All the processor's instruction codes were described, showing how they affect the registers, flags, and memory, as well as describing how the instructions and data are stored in the memory and their execution.

We are now at the point where we can start the more practical side of machine code programming, using an assembler and running some simple examples. It is recommended that you experiment with such simple programs. Do not be disheartened if things do not go as expected, you will learn a lot from your mistakes, such as saving a copy of your program in case it crashes! Lastly, if you have any difficulties which you can't solve over a cup of coffee and a few back issues then I will be pleased if you drop me a line explaining your problem – no matter how simple. Suggestions as to what topics you would like to see covered in future articles would be useful as well as any comments you may have.

Why an Assembler?

We already know that each instruction has been given a standard three letter mnemonic to help remember its purpose. In the last issue there was a complete list of these mnemonics and their associated op-codes. The term 'hand assembly' is given to the process of manually converting an assembly language program into machine code by the use of such a table. However, the task is made more tedious by the fact that most mnemonics have more than one op-code entry in the table, each allowing for the different addressing modes the instruction can be used in. Then there is the added complication of changing all numbers into one base, say decimal, for entry into the computer. There are many more reasons why hand assembly becomes difficult and slow, that's apart from any mistakes you can easily make when working with pages of numbers.

Assemblers overcome all the problems associated with hand assembly because the process of converting assembly language (of mnemonics, labels etc.) into machine code becomes just one command. Assemblers have many more advantages than just converting assembly language that make the development of a program a lot easier. Most assemblers are supplied with a powerful editor to create and modify assembly language programs and a 'debug' or 'monitor' program that allows you to look at memory locations, dis-assemble machine code back into mnemonics and many more useful features that will help you to test and find bugs in your programs. Even when writing small subroutines you will find an assembler is a luxury over doing things by hand. I would advise you to invest in one of the several assemblers available if you intend to get to grips with the code, in the long run it will save you time and frustration!

This series will be centred around the ATARI Assembler Editor cartridge which is perhaps the most popular among users, it is not the best, but it is easy to use and quite comprehensive. Apart from the actual speed of assembly, other assemblers tend only to differ in minor respects, or offer features which only an advanced programmer may find useful, such as macros. An excellent compromise over a commercial assembler is USERCOMP, although a little limited in that most of the features associated with an assembler are missing, you can enter all the mnemonics and is great for writing small routines or for experimenting with. For just one pound, or for free under the exchange offer, you can't complain!

Get those Fields in File!

There are two types of files which are associated with an assembler, the source file and the object file, these reside on either disk or cassette. The source file represents the assembly language program which you create and modify with an editor. This is analogous to how you enter and save a BASIC program except that the program is usually saved as pure text, i.e. exactly as you typed it.

When you decide you want the machine code for the assembly language you command the assembler to compile the source file. The source file will be read and an object file created, this will be actual machine code, on a disk system you could 'binary load' this file (directly from DOS) into memory. Remember that any changes you want to make to your program should be made to the source file, re-compiling will then give the updated version of the machine code, in the object file, ready for execution. At this point the fundamental difference between a language like BASIC and an assembler should be clear: BASIC is an interpretive language and executes statements directly from a source file, line by line, and therefore BASIC has to be resident to run the program. An assembler is a compiling language and works with two files – source and object – and converts all the statements in the source file into directly executable machine code in the object file, therefore the assembler does NOT have to be resident to run the object code.

We will now look at the structure of the source file in some detail. The file consists of lines of text, each line is thought to consist of fields of characters. Here a field consists of one or more adjacent characters, each field is separated by one or more spaces – analogous to the words in a sentence. The first field is normally a line number, this has NO effect on the assembler what-so-ever.

Line numbers are used by most editors to keep track of lines and as such are completely ignored by an assembler if they are present. We shall, therefore, call the first field either the one at the start of the line or the one following the line number (by one space), depending on which type of editor you are using. A line can have from one to four distinct fields.

The Label Field

A label must start with a letter and can have any mixture of letters and digits following it, forming a 'name' for the label – similar to a variable name in BASIC, except there is usually a limit of upto six characters only. Labels are used to represent numeric values; once a value has been assigned to a label then where ever the label is used its value will be substituted during the assembly of the program. The first field on a line is reserved for a label name – you will see the use of labels soon.

The Operation Field

The second field is the operation field and is where the familiar op-code mnemonics are written, such as LDA. Pseudo-operations, also known as assembler directives, are also written in this field and are used to control the operation of the assembler when compiling your source code.

The Operand Field

Operands are written in the third field and are the data for what is in the operation field. The type of operation will determine if an operand is necessary or not. Any label which was previously defined (by placing its name in the first field) can be used in the operation field – the effect is the same as writing the actual value of the label in place of it, so labels are effectively substitutes for fixed values, or constants.

The Comment Field

Comments are simply a string of characters commenting the operation of the program, similar to the REM statement in BASIC. The start of a comment is usually signified by a semicolon (;), when this is reached the rest of the line is completely ignored. The comment field is an exception in that it can start at any place on a line. They can take up a whole line or can be placed at the end of any existing line. The use of comments helps describe what a program is doing and should be used quite liberally throughout any program as documentation. If you find an old program at the bottom of a drawer then the comments will prove invaluable to remembering what it did and how!

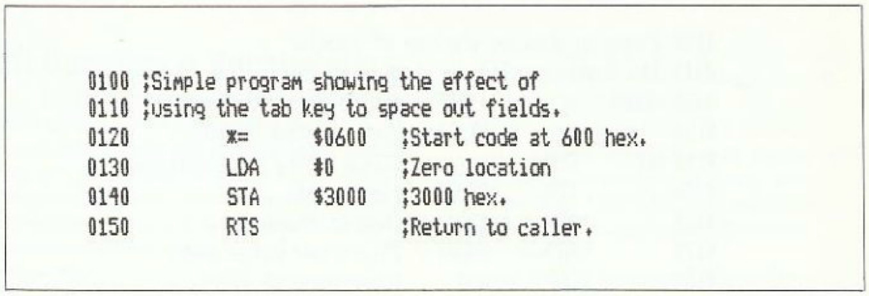
Neat Fields

At least one space must be used to skip a field, if the tab key is used to space fields out you will not have to worry about the exact spacing and as a bonus you will find that they line up neatly from line to line. The following shows some possible field layouts:

```
100  LABEL  LDA  #$3A ;Minimum spacing.
200         PLA       ;Operation only.
300  PLA              ;Same, but with
                       minimun spacing.
```

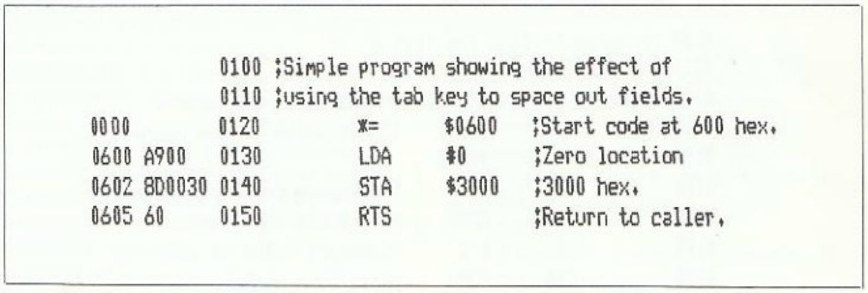
From now on tabs will be used to space these fields out. Listing 1 shows a complete program. The program loads the accumulator with the value zero, stores this at location 3000 hex and then returns to the calling program. The third line down contains:– '*= $0600', the '*=' is an assembler directive which sets the origin or location counter of the assembler to 600 hex. This causes the machine code to be generated from location 600 hex onwards. Such a command must preceed any program to determine where the code will be stored and can be used anywhere else, thus spliting the code up into different sections of memory if desired.

Listing 2 is the output from the assembler during the assembly, it is an exact copy of Listing 1 except that two extra columns of numbers have been appended to the left hand side. These show the contents of the location counter and the contents of the memory, respectively. From this we can see that 'A9', the op-code for 'LDA', is stored at location 600 hex and that '00', the operand, or data, is stored in the next location of 601 hex, the next line shows the count or address at the next location of 602 hex as expected. Therefore, by looking at the second column of numbers we know the exact contents of the object file, i.e. the actual machine code for our program and the address of any particular byte.



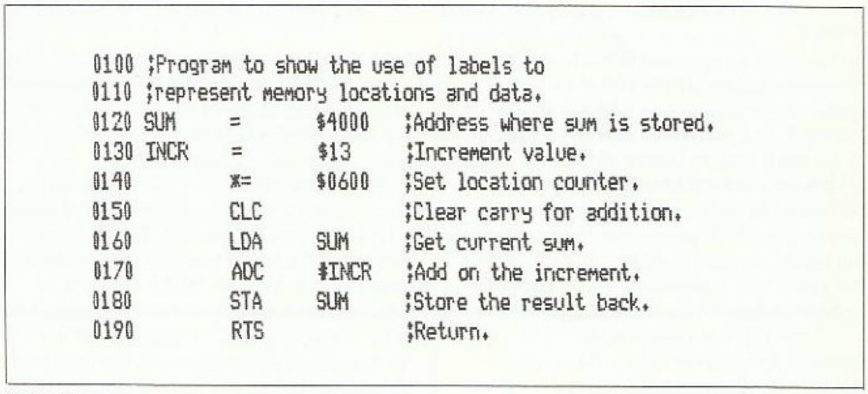
```
0100 ;Simple program showing the effect of
0110 ;using the tab key to space out fields.
0120        *=     $0600   ;Start code at 600 hex.
0130        LDA    #0      ;Zero location
0140        STA    $3000   ;3000 hex.
0150        RTS            ;Return to caller.
```

Listing 1



```
                0100 ;Simple program showing the effect of
                0110 ;using the tab key to space out fields.
0000            0120        *=     $0600   ;Start code at 600 hex.
0600 A900       0130        LDA    #0      ;Zero location
0602 8D0030     0140        STA    $3000   ;3000 hex.
0605 60         0150        RTS            ;Return to caller.
```

Listing 2



```
0100 ;Program to show the use of labels to
0110 ;represent memory locations and data.
0120 SUM    =     $4000   ;Address where sum is stored.
0130 INCR   =     $13     ;Increment value.
0140        *=    $0600   ;Set location counter.
0150        CLC           ;Clear carry for addition.
0160        LDA   SUM     ;Get current sum.
0170        ADC   #INCR   ;Add on the increment.
0180        STA   SUM     ;Store the result back.
0190        RTS           ;Return.
```

Listing 3

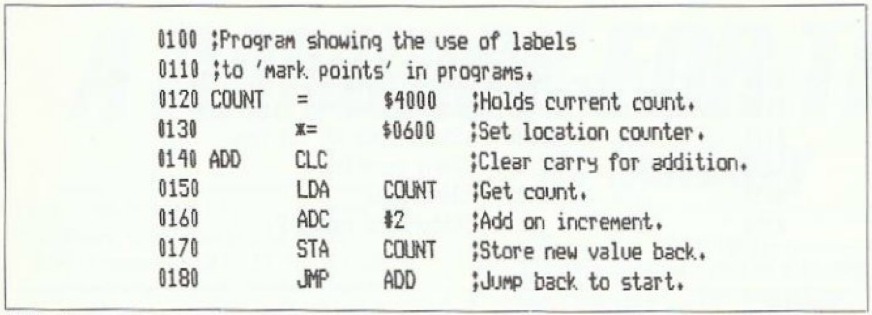
Label It

Listing 1 does not have anything in the first field, i.e. labels. If a label is placed in the first field then it is assigned a value. This value will be the contents of the location counter, i.e. the current address. Another method exists for assigning a value to a label by using the '=' or equate directive in the second field, the operand following this will then be the value assigned to the label. It should be noted that the assignment of a value to a label can only be made ONCE during a program. Once given a value, the label can then be used in the operand field as the data to whatever is in the previous field. When assembled the value of the label is substituted for the label's name.

Labels are used to give names to memory locations or data. One advantage of using labels is that they aid your memory, instead of remembering or looking up a value repeatedly, a meaningful name can be given to the value and then the label name can be used where ever needed. Another advantage is obvious, if you want to change a value then you haven't got to search the entire program changing the value many times, instead you would only need to change the value of the label (at the start of the listing).

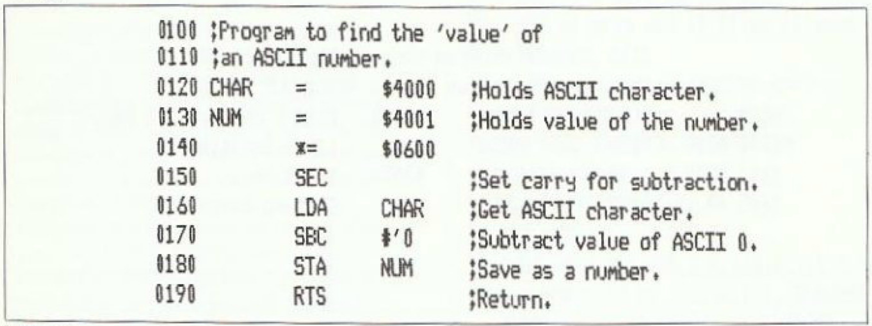
Listing 3 shows the use of labels to represent memory locations and data. The program adds an increment to a memory location and stores it back again. Line 120 assigns the value of 4000 hex to SUM, this is the address where the number to be incremented is stored. The next line assigns the value of 13 hex to INCR, this represents the amount to be added to the sum. The rest of the program is as normal except that where an address or data is needed the label name is used instead. When assembled, the label names are simply substituted for their values in the operand field. Therefore the effect is exactly the same as if, for example, line 160 read: 'LDA $4000'.

If we now wanted to change the address of SUM we only have to change it



```
0100 ;Program showing the use of labels
0110 ;to 'mark points' in programs.
0120 COUNT  =     $4000    ;Holds current count.
0130        x=    $0600    ;Set location counter.
0140 ADD    CLC            ;Clear carry for addition.
0150        LDA   COUNT    ;Get count.
0160        ADC   #2       ;Add on increment.
0170        STA   COUNT    ;Store new value back.
0180        JMP   ADD      ;Jump back to start.
```

Listing 4



```
0100 ;Program to find the 'value' of
0110 ;an ASCII number.
0120 CHAR   =     $4000    ;Holds ASCII character.
0130 NUM    =     $4001    ;Holds value of the number.
0140        x=    $0600
0150        SEC            ;Set carry for subtraction.
0160        LDA   CHAR     ;Get ASCII character.
0170        SBC   #'0      ;Subtract value of ASCII 0.
0180        STA   NUM      ;Save as a number.
0190        RTS            ;Return.
```

Listing 5

on line 120, as opposed to having to change both line 160 & 180, if we had written the actual value of $4000 there. Listing 4 uses two labels, the first is defined in the same way as before and is the address of a count. Line 140 has the second label, ADD, however this time it preceeds a 6502 mnemonic. In this case the value assigned to ADD is the address of the instruction it preceeds, which happens to be the start of the program, i.e. 600 hex.

Line 180 is a jump instruction, it jumps to the address held in ADD, so in this case it is the same as writing: 'JMP $600'. Thus the program continues in a never ending loop adding two to COUNT every time it goes around the loop. Labels can, of course, be placed anywhere in a program, a jump or branch can then be made to the label, instead of trying to work out which location the instruction is stored in. The use of labels in this way can be thought of as 'marking points' in a program which can then be jumped to by reference to the label or 'marker'.

Odd Expressions

Yet another advantage of an assembler is to evaluate expressions in the operand field. For instance: LABEL = 2*3+1 will evaluate the expression on the right hand side to be seven and then assign the value seven to LABEL. Such an expression can contain other label names which are already defined, these expressions can also be used as an operand to a 6502 instruction. This facility does not provide a short cut to doing multiplication and division in machine code; expressions are evaluated once at assembly time and are then used in programs as a fixed value – just as a label has a fixed value. The use of these expressions does, however, save you having to use a calculator to work out a constant, instead the computer works it out for you at assembly time. A useful expression is the single quote followed by an ASCII character, when the expression is evaluated the ASCII value of the character becomes the operand – this saves looking up characters in tables of ASCII values and writing that value down. Listing 5 demonstrates the use of this. Assuming the location at CHAR contains the ASCII value of a digit between 0 and 9, the program will place the actual number that character represents in location NUM. The ASCII value of 0 is 48 decimal, the characters 1 to 9 have the consecutive values of 49 to 57, so to convert the character to the number it represents we simply have to subtract the value of ASCII 0 from it. Line 170 does the subtraction, the '0 is evaluated to be 48, the ASCII for the character 0, the result is then stored in location NUM. For instance, if the ASCII character was 9 then 57 would be in location CHAR, by subtracting 48 from this we get the actual value of 9, stored in location NUM.

Getting It Together

Having seen a lot of examples on the features of an assembler, we will end by writing a program which, when called by BASIC, will multiply two integer numbers together and return the answer to BASIC. Although not being spectacular, it will hopefully bring together a lot of ideas and principles covered so far in this series and should be fully understood.

Using the User

Before we can start we need to look at the mechanism by which BASIC allows the user to call machine code routines – by the aptly named 'USR' command. This command also allows numbers, known as parameters, to be passed back and forth between the two. The general form of the command is:

X=USR(ADDR,PAR1,PAR2...)

Where 'ADDR' is the address in memory where the routine starts and 'PAR1', 'PAR2', etc., are the parameters to be passed; the parameters are separated by commas and the number of these can vary from none to as many as BASIC will let you type on one line. All these numbers should be integers between 0 and 65535 (although BASIC does round-off any non-integers). An integer, in the same range, can also be passed back into the variable X of the USR command.

The numbers BASIC passes are saved on the stack. By doing this we don't have to worry about exactly where they are stored in memory, to retrieve these numbers in the machine code we use the PLA command which takes the last entry of the stack and puts it into the accumulator. The first number pulled back tells us how many parameters BASIC stored on the stack, e.g. if zero, then it tells us that there were no parameters supplied by the user. This can be used to see if the actual number of parameters is equal to the number you expected, if not, the error can be dealt with. Most of the time it is ignored and assumed that the user knows how many parameters he should supply, however, using this method means that if you do give the wrong number of parameters it will almost definitely crash on you, so be careful. Once the parameter count has been taken off the stack, the parameters are then removed, two bytes for each. The first PLA will give the high byte of the first parameter in the USR command, the second PLA will return the low part of this same parameter, the rest are taken off in the same manner until all are removed. If everything went well, then the return address will be left on the top of the stack ready for an RTS to take you back into BASIC. To return a value to the BASIC variable used in the USR command then, you simply store the low part in location 212 and the high part in 213 (decimal). On return, BASIC sets the variable equal to the value of this two byte integer.

Doing the Multiplication

The easy way to multiply two numbers together is simply to add one of them repeatedly to a result, the number of times will be determined by the other number, for instance: 2*3 is the same as 2+2+2, i.e. 2 added on three times. This is obviously very inefficient, especially for large numbers, as a lot of addition will be involved, better methods do exist but we will stick to this one for its simplicity. Using our method, we need to add the multiplicand to the result by the number of times indicated by the multiplier. For the example of 2*3, the multiplier is 3, thus we add 2 onto the result 3 times to get the answer of 6. However, this is exactly the same as 3*2, now the multiplicand is 3 and the multiplier is 2, this means that we do one less addition than before, i.e. 3+3. This is better illustrated by 1*255 which takes 255 additions of 1 instead of 1 addition of 255 for 255*1. The method, or algorithm, for our multiplication now becomes: Firstly, if the multiplier is greater than the multiplicand then swap them over, we then zero the result and add the multiplicand to the result by the number of times as the value of the multiplier.

```
               0100 ;Simple multiplication of two single byte
               0110 ;integers by repeated addition.
00CB           0120 MLTPND  =     $CB     ;Multiplicand.
00D4           0130 RESULT  =     212     ;Result for BASIC.
0000           0140         *=    $0600   ;Start on page 6.
0600 68        0150         PLA           ;Discard number of data.
0601 68        0160         PLA           ;Discard high byte.
0602 68        0170         PLA           ;Get low byte.
0603 85CB      0180         STA   MLTPND  ;Save as multiplicand.
0605 68        0190         PLA           ;Discard high byte.
0606 68        0200         PLA           ;Get low byte.
0607 AA        0210         TAX           ;Save as multiplier.
0608 C5CB      0220         CMP   MLTPND  ;Compare both.
060A 9005      0230         BCC   NOSWAP  ;OK if MLTPLR<MLTPND.
060C A5CB      0240         LDA   MLTPND  ;Swap MLTPLR
060E 86CB      0250         STX   MLTPND  ;for MLTPND
0610 AA        0260         TAX           ;so that MLTPLR<MLTPND.
0611 A900      0270 NOSWAP  LDA   #0      ;Zero the result
0613 85D4      0280         STA   RESULT  ;low
0615 85D5      0290         STA   RESULT+1;and high.
0617 E000      0300 MLTPLY  CPX   #0      ;If MLTPLR=0 then
0619 F00F      0310         BEQ   EXIT    ;exit loop.
061B 18        0320         CLC           ;Clear carry.
061C A5D4      0330         LDA   RESULT  ;Add in MLTPND
061E 65CB      0340         ADC   MLTPND  ;to the result
0620 85D4      0350         STA   RESULT  ;and save back.
0622 9002      0360         BCC   NOCARY  ;No carry so branch.
0624 E6D5      0370         INC   RESULT+1;Else adjust high byte.
0626 CA        0380 NOCARY  DEX           ;Decrement count
0627 4C1706    0390         JMP   MLTPLY  ;and go back.
062A 60        0400 EXIT    RTS           ;Exit back to BASIC.
```

Listing 6

Listing 6 shows the completed assembly program, the following describes how you might go about entering it into an assembler to compile it. If you have an assembler editor cartridge then you would type in everthing except the two columns on the far left, the comments are, of course, optional. If you have a different assembler then you would need to change a few minor things, see the appropriate manual for some help. Table 1 gives some guidelines for conversion between most of the popular assemblers. Before assembling the code you would save a copy of this as a source file (disk owners should note that the extension of .SRC is often used to denote the source file), assembly of the program is then done to an object file (for disk the extension of .OBJ is widely used). Assuming there were no errors then the contents of the object file would be the same as the second column of Listing 6 and would load into the addresses shown in the first column, i.e. page 6 (600 hex) onwards.

How it Works

The equates on lines 120 & 130 set up two labels, MLTPND will hold the multiplicand and is at location CB hex, RESULT is set to point to location 212, this is where BASIC picks up the value for the variable in the USR statement. Next the location counter is set so that the code produced is placed from 600 hex onwards. The first PLA gets the number of BASIC's parameters into the accumulator, however, this is discarded, as is the high byte of the first parameter, this leaves us with the lower half in the accumulator after the third PLA and is saved as the multiplicand by the following STA instruction at location MLTPND, i.e. CB hex. Two more PLA's leave the low part of the second parameter in the accumulator and is saved in the X register by the TAX instruction as the multiplier. Only the low part of each parameter is saved so that neither number can exceed 255, by doing this the result will not need more than two bytes which is the maximum size we can return to BASIC's variable.

We now want to see if the multiplier is less than the multiplicand to minimise the number of additions. A copy of the multiplier is still in the accumulator at this point, the compare instruction then subtracts the multiplicand from it, leaving only the N,Z and C flags affected. We want to skip the swap over if the accumulator was less than the data, i.e. the comparison left a borrow condition because the larger data was subtracted from the smaller value in the accumulator. If a borrow occured then the carry (C flag) would be cleared, the next instruction, BCC, would then branch over the following three instructions to NOSWAP, thus not doing the swap. You can see by looking at the machine code, on the left, that the assembler has converted the address of NOSWAP (611 hex) into the offset of 05, following the opcode of 90 for the BCC instruction, yet another thing the assembler does for you!

If the branch failed then the instructions on lines 240, 250 & 260 swap the multiplier and the multiplicand over, the accumulator is loaded with the multiplicand and then the multiplier, in the X register is saved as the new multiplicand, finally the accumulator is moved back into the X register as the new multiplier. Which ever path was taken, when the LDA instruction is reached at NOSWAP, the multiplier will be in the X register and the multiplicand will be in MLTPND with X being the lesser of the two. At NOSWAP the accumulator is loaded with zero and is stored at location RESULT (212), as the result will take two bytes we must also zero the high part at the next location. Rather than define another label to point to location 213, RESULT+1 is used, this is equivalent to 212+1 which is location 213, the high part of the result.

The multiplier is in the X register so that it can be used as a count, every time an addition is done we will take one from the count until it reaches zero. The test for this count being equal to zero is made on line 300, which compares the X register to the number 0, if it is then the 'branch if

Description	Atari Assm/Edtr Cartridge	Synapse Syn Assm Disk	O.S.S. Mac 65/Bug 65 Disk or Cartridge	Atari Macro Assm Disk
Set origin (Location counter)	*=	.OR	*=	ORG
Value of location counter	*	*	*	*0
Equate (assignment)	=	.EQ	=	= or EQU
Define bytes/ characters in memory	.BYTE	.AT .HS .AS	.BYTE .SBYTE .DBYTE	DB DC
Define words in memory	.WORD	.DA	.WORD	DW
Skip bytes	*=*+	.BS	*=*+	DS

Table 1. Assembler Conversion Chart

Continued on page 32.

FAST FILL

BY KEITH MAYHEW

So you thought you had seen the last of Graphics 8 utilities with the excellent Quick-Plot, eh? Well here is yet another! If you have ever used the fill routine in the operating system, via the XIO command, you would have realised its limitations; it only fills four sided shapes and is very slow. Drawing utilities, such as ATARI ARTIST, can fill in any shape you design and quite fast. Fast Fill uses a similar method to these programs and allows you to fill any shape on a Graphics 8 screen, and fast.

Listing 1 is a simple demo program in BASIC. Type it in and remember to save a copy before you run it. If the program crashes then re-load it and check all the numbers in the DATA statements. Assuming the program runs OK, the screen should clear after a short delay while the machine code is read in. The little flashing pixel in the middle is a cursor! It can be moved in all eight directions with a joystick and lines can be drawn by pressing the fire button down. Once you have drawn a shape place the cursor inside it and press the START button to fill it up. Remember that if you do not properly enclose the area to be filled the whole screen will be filled up, even if only one pixel was missing.

To use the machine code fill routine in your own programs list lines 30000 to 32380 to disk or cassette (e.g. LIST "C:",30000,32380) and then enter it onto your own program (e.g. ENTER "C:").

To initialise the machine code you will have to place a GOSUB 30000 at the start of your program and then call the machine code by something similar to: Z=USR(ADR(FILL$),X,Y), where the pixel at which to start the fill is held in X and Y. A word of caution; in order to make the fill fast there is no error checking to see if it goes off the top or bottom of the screen...CRASH! To avoid this problem either make sure the shape is completely contained or draw a border around the screen as in the demo program.

The fill routine has been split into two parts; the initialisation section is held in a BASIC string (FILL$) and the main part is in page 6 (no, not the magazine!). The initialisation section first points a software stack to just under the screen memory, this grows downwards as pixel addresses are pushed onto it. The rest of this section converts the X & Y co-ordinates into a screen memory address for that pixel. As there are eight pixels per byte in this mode a 'plot mask' is calculated which contains one bit set to a '1', so that when ORed onto the screen at the screen address, will plot the correct pixel. A jump is then made into the main section in page 6.

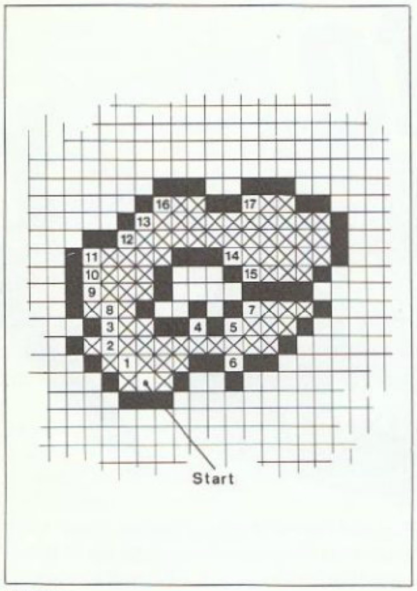
The method by which the shape is filled is in horizontal runs or lines. While a run is in process the adjacent lines are examined and continuation addresses are

Listing 1

```
EI 1 REM ********************************
NH 2 REM
BS 3 REM FAST FILL
NJ 4 REM
MJ 5 REM by Keith Mayhew
NL 6 REM
VH 7 REM for Monitor Magazine
NN 8 REM
EQ 9 REM ********************************
SW 100 GOSUB 30000
LJ 110 GRAPHICS 8+16:X=160:Y=96:POKE 709,
   15
KZ 115 COLOR 1:PLOT 0,0:DRAWTO 319,0:DRAW
   TO 319,191:DRAWTO 0,191:DRAWTO 0,0
FS 120 S=STICK(0):LOCATE X,Y,C:COLOR 1-C:
   PLOT X,Y
ED 130 FOR I=0 TO 5:NEXT I:COLOR C:PLOT X
   ,Y
CU 140 X=X+(S=5 OR S=6 OR S=7)
AP 150 X=X-(S=9 OR S=10 OR S=11)
CD 160 Y=Y+(S=5 OR S=9 OR S=13)
DB 170 Y=Y-(S=6 OR S=10 OR S=14)
ML 180 IF  NOT STRIG(0) THEN COLOR 1:PLOT
    X,Y
AC 190 IF PEEK(53279)=6 THEN Z=USR(ADR(FI
   LL$),X,Y)
MD 200 GOTO 120
WM 30000 REM Read in machine code for fil
   l.
```

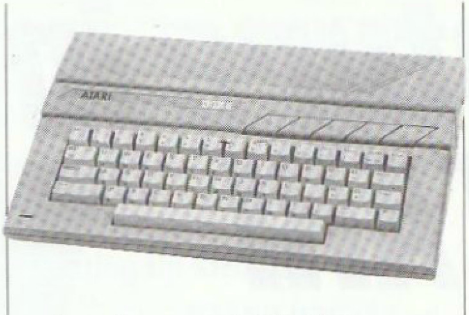
```
ZD 30010 DIM FILL$(118)
YF 30020 FOR I=1 TO 118:READ D
EM 30030 FILL$(I,I)=CHR$(D):NEXT I
AB 30040 FOR I=0 TO 184:READ D
DC 30050 POKE 1536+I,D:NEXT I
DX 30060 RETURN
HH 32000 DATA 104,173,229,2,133,206,173,2
   30
MS 32010 DATA 2,133,207,104,141,186,6,104
SF 32020 DATA 141,185,6,169,0,141,189,6
FF 32030 DATA 104,104,10,46,189,6,10,46
LQ 32040 DATA 189,6,10,46,189,6,133,203
HL 32050 DATA 174,189,6,134,204,10,46,189
IY 32060 DATA 6,10,46,189,6,24,101,203
VR 32070 DATA 133,203,165,204,109,189,6,1
   33
MF 32080 DATA 204,173,185,6,41,7,170,169
JX 32090 DATA 0,56,106,202,16,252,133,205
NI 32100 DATA 173,186,6,74,173,185,6,106
IF 32110 DATA 74,74,24,101,203,144,2,230
ZN 32120 DATA 204,56,233,40,176,2,198,204
SO 32130 DATA 24,101,88,133,203,165,89,10
   1
FT 32140 DATA 204,133,204,76,0,6
HQ 32150 DATA 160,40,177,203,36,205,208,2
   0
UY 32160 DATA 6,205,144,248,38,205,165,20
   3
```

```
ZL 32170 DATA 208,2,198,204,198,203,177,2
   03
VN 32180 DATA 208,234,240,242,169,1,141,1
   87
WW 32190 DATA 6,141,188,6,70,205,144,8
PR 32200 DATA 102,205,230,203,208,2,230,2
   04
UN 32210 DATA 160,40,177,203,36,205,208,5
   6
WW 32220 DATA 5,205,145,203,173,187,6,240
OX 32230 DATA 11,160,0,177,203,36,205,208
KO 32240 DATA 3,32,146,6,160,0,177,203
GY 32250 DATA 141,187,6,173,188,6,240,14
XL 32260 DATA 160,80,177,203,36,205,141,1
   88
AP 32270 DATA 6,208,3,32,146,6,160,80
WX 32280 DATA 177,203,141,188,6,76,36,6
UQ 32290 DATA 165,207,205,230,2,208,7,165
QD 32300 DATA 206,205,229,2,240,58,160,0
KK 32310 DATA 162,2,177,206,149,203,230,2
   06
SJ 32320 DATA 208,2,230,207,202,16,243,76
CX 32330 DATA 0,6,166,204,56,165,206,233
BW 32340 DATA 3,133,206,176,2,198,207,152
HU 32350 DATA 56,233,40,176,1,202,24,101
GB 32360 DATA 203,160,2,145,206,138,105,0
VA 32370 DATA 136,145,206,165,205,136,145
   ,206
OE 32380 DATA 96
```



Diagram

placed onto a stack, when a run is complete the last stacked address is removed and the process continues from there until the shape is filled i.e. the stack is empty. When first entered, the routine searches to the left of the current line until a border or edge is reached. The line is then plotted pixel by pixel to the right until the right border of the run is reached. While doing this, it looks at the two



adjacent lines to see if a left edge is detected, this requires knowing the state of the previous pixel as well as the current one. To achieve this two flags are kept updated with the state of the last pixel examined. If the previous pixel (flag) was set and the current pixel isn't then the pixel address and plot mask äre stacked. If the extreme left edge of the adjacent lines fall before the current one then this starting edge would not be detected, it is for this reason that both flags are set at the start of a line. Then if the first pixel directly above (or below) the start of the current line is cleared then the point will be stacked. If the stack is then empty it is the end of the fill, else the last address is pulled back and jumps back to the start which continues the same process from this point. To help you understand the fill process, the diagram shows a filled shape. The numbers indicate the order and the place where left edges or

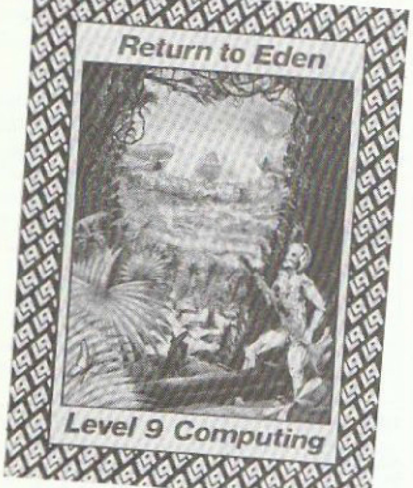
Point being used for PLOT	Stack contents [After PLOT]
START...........	1
1.............	2
2.............	3,4, 5,6
6.............	3,4, 5
5.............	3,4, 7
7.............	3,4
4.............	3
3.............	8
8.............	9
9.............	10
10	11
11.............	12
12	13,14
14	13,15
15.............	13
13.............	16,17
17.............	16
16.............	EMPTY

Table

starting points were found and stacked. The table then shows the order in which the lines where drawn from these stacked values and shows the pixel numbers on the stack after the line has been drawn.

Adventure into the ATARI

by STEVEN HILLEN



Return to Eden

32K Cassette £9.95

This is Level 9's long awaited sequel to Snowball, which has become a bit of a classic because of its enormous size. For those of you unfamiliar with Snowball's plot, here it is. You are Kim Kimberly, appointed to watch over the safety of two million colonists on board the Snowball 9 spaceship on route to Eden, another planet. You awaken to find that the ship is headed towards a star, and all the robots are now homicidal! At the end of the adventure, you confront and defeat the saboteur, and rescue the Snowball.

In the sequel, false video-tapes show that Kim him (her?) self was the saboteur, and Kim is sentenced to death. Luckily, Kim escapes in a strato-glider and lands on Eden. Unfortunately, the colonists are out for revenge and turn the ship's rockets on you, devastating the land. If you should survive this, you emerge in a strange jungle where most of the normally friendly wildlife is after your blood! On the subject of death, you are at least given a few chances, appearing strangely resuscitated inside a tree-pod.

Through a 'see-bee' telescope you can preview the task ahead with minefields, gunships, towers and the jungle all barring your way to the city, Enoch, which you must rescue from the onslaught of the jungle, and where you must prove your innocence to the colonists. You can expect this to take quite some time.

Well, you can't ask for a more dramatic plot than this, and coupled with a good parser, this game deserves to be a hit. I can't wait to see the final part of the trilogy, 'The Worm in Paradise' where you are rumoured to have to try and discover whether the whole universe is just some puppeteer's toy.

Cutthroats

48K Disk £32.50

As an out of work deep sea diver on the miserably dull Hardscrabble Island, life is incredibly boring. The treacherous seas surrounding the island defy anyone to retrieve the sunken treasures they conceal. Then, one night, an old seamate of yours, Hevlin, arrives at your hotel room door. He passes you a book revealing the location of a large haul of treasure, then dashes off. You hear a scuffle outside as Hevlin is murdered. You awake the following morning to find a mysterious note that has been slipped under your door, inviting you to a meeting.

If you've ever wanted to play the leading role in a pirate adventure, then play 'Cutthroats'. No other game I've played has quite had such completely convincing characters with such realistic responses. The plot also twists and turns, sweeping you into the story.

In order to claim your riches, you must join forces with the likes of Johnny Red and his band of cut-throats. Even when you do gain their confidence, they cannot be trusted, for the Weasel is ready to slit your throat at the slightest hint of treachery.

To start the game, you are supplied with a rather useful map locating the shipwrecks, a price list for Outfitters International who can supply your diving gear, and a tide timetable. Each time you play, you may have to search for a different wreck, as there are 4 in the game. There seems to be no limit to what you can do in this adventure, for it understands over 800 words. I keep going back to this game, it's just like being in a Robert Louis Stevenson novel, not knowing what will happen next. Infocom are still showing the rest how adventures should be written.

Emerald Isle

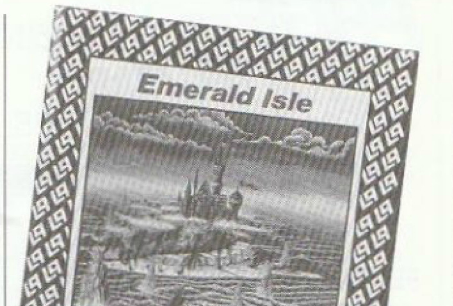
32K Cassette £6.95

This is an adventure that seems to have something of everything, and is again up to Level 9's consistently high standard. It is being sold for £3.00 less than usual as it is rated as an easier adventure, although I still think it's pretty challenging. A line-map of the island is supplied in an ever-improving style of packaging, along with some large glossy posters.

You arrive on Emerald Isle (somewhere in the Bermuda Triangle) by silk parachute which unfortunately snags in the trees. Vultures watch your attempts to escape. Next, you discover a tree-top fantasy city which is strangely deserted except for a bored King who seems to have issued some kind of challenge. If you're carrying the right goods, then both the guard and seamstress will help you.

Back down on the ground, avoid climbing onto the railway tracks, otherwise the inevitable happens. Instead, you can enjoy a ride to the seaside station which backs onto a glorious beach. It soon becomes apparent that you need some light to explore the mine and the cave (not the inside of the spider!), so if you can build a canoe, the second island may provide some help.

In this game, points are scored for swelling the King's coffers, although the ultimate objective is to escape from the isle.



Why then is it rated as a beginner's adventure? Well, unlike all the other Level 9 adventures, there is usually just one way you can go to proceed with the game. Instead of deciding where and when to go, you need only find a method of getting there.

Emerald Isle is unusually good value for money and great fun to play as there is so much variety. Thanks to Level 9 for producing such games, and for sending me review copies.

```
Welcome friends to QUESTPROBE(tm)
number 2: SPIDER-MAN by Scott Adams.
Dedicated to John Mathias a TRUE
BELIEVER! SPIDER-MAN, MYSTERIO,
DOCTOR OCTOPUS, ELECTRO, HYDROMAN,
SANDMAN, LIZARD, RINGMASTER, CHIEF
EXAMINER, MADAME WEB, and their
        <HIT RETURN>
```

Spiderman

16K Cassette £7.95, 48K Disk £17.95

This is the second of Scott Adams' 'Questprobe' series, the first being 'The Incredible Hulk', of course. The game is available on disk or cassette, but only the disk version has graphics.

Spiderman starts in a mysterious office block virtually surrounded by Marvel characters. As with the Hulk, your score is increased by gathering the gems together. However, the Hulk was at least consistant and vaguely credible, whereas Spiderman fails on both counts. The reason for these gripes are as follows. The whole situation seems very contrived, for in almost every room there is another 'trumped-up' superhero who must be defeated or used in some way or another. OK, Spiderman himself may not be totally convincing, but the Sandman and Madame Web are absolutely comical. Unfortunately there are also some logical faults within the game, an example being when going down one floor, out of the window and finding yourself at the very top of the building.

The screen format and parser have been left unchanged from previous adventures, so they are adequate but slow at times. There seems to be a number of themes that may run through the whole Questprobe series. One is the method of resuscitation when you die, another is the re-appearance of the natter energy egg. I hope that the third in the series will not be another treasure hunt, one or two of the win/lose situations such as The Count would be a welcome change. All in all then, Spiderman is, to me at least, just another unmemorable adventure.

Dallas Quest

48K Disk £14.95

Well, here is the first adventure that Datasoft have written since the graphically excellent and challenging 'Sands of Egypt'. Not being a Dallas freak myself, South Fork Ranch isn't as exciting a scenario as ancient Egypt. The game loads with a picture of J.R. and the theme music from the TV series, and the game starts in the living room with Sue Ellen. The graphics are again quite outstanding, but the adventure itself is poor, simple and illogical. It has been completed by some adventurers in less than an hour, hardly giving them their monies worth nor much satisfaction.

The game centres on finding a new oil deposit near the ranch, which is not too difficult if you can avoid being beaten up at the main gate by some local yobbos, or by the equally improbable giant rat which lurks in the barn. Just as inconsistent is the monkey blocking the hole in the boat with his tail!

It really is a shame to see such excellent graphics, sound and overall programming wasted on such an intrinsically poor game. In short then, recommended for incurable Dallas fans only.

Letters Section

Well, this time you seem to be running out of questions for me to try and answer. Maybe you're all such experts by now that you no longer need assistance? However, I haven't heard of anyone who's yet escaped from Issue 8's 'Nightmare Reflections', so here are some gratuitous clues which you should follow very closely...

Push around, ways abound.
Touch to show the node, the watch completes the code.
It's hard to reside in a SQUARE of SIDEs.
Rainbow colours one to seven just add to the problem.
Initialise the paper clue for the final thing to do.
Nine more true moves make, and then you'll be awake.
Fishy draughts are just for laughs.

One false step then, and it'll be another ten!

Back to commercial adventures again, the remaining unanswered questions are below. If you can answer any of them, I'd be pleased to hear from you. If you're hopelessly stuck with a game, then write in, and I'll try to help. If you've completed an adventure, again please let me know, and I'll add it to a list I'm compiling for next time. Thanks to all those who wrote in this time.

Lastly, thanks to Peter Lister for answering several queries, and for letting me preview his rather good adventure, The Amulet.

Unanswered Questions

Savage Island II
Can't kill dinosaurs nor change back from Neanderthal.

Escape from Pulsar 7
Can't remove cups from captain's cabin ceiling.

Waxworks.
Where is the well?

Curse of Crowley Manor
Have combination but can't get past monster in 'numerical lock' room.

Answered Questions

Ten Little Indians
Can't do anything with couch nor safe.

```
10 DIMA$(40):A$="MY_MR*S]* \
ON*RO\ \ SXQ8*NSKV*;CB="
20 FOR A=1 TO LEN(A$):A$(A,A)=
CHR$(ASC(A$(A,A))-10):NEXT A:? A$
```

by Tony Cheung.

BOOTBASE

by Sol Negrine

This program reads the directory of your 'Multiboot' disks (sectors 48 and 49), and optionally allows you to print out labels, to show program names, sizes and free space on each disk, and also it appends the entries to a DOS file named PROGLIB.DB which is created and/or unlocked as required. This file is compatible with the APX Diskette Librarian system, which will allow you to sort and print your entries, (note that any existing data on the DOS file is retained).

You may wish to customise the label formats to suit your own printer, this can be done by ammending the PRINT statements in lines 385 – 414 as appropriate. The use of PRINT #3 statements instead of LPRINT is to allow one to compile BOOTBASE with the excellent ABC Compiler from Monarch Data Systems. Please note that the program features delay loops which will be excessive if you RUN the program from BASIC without compilation. Ammend these as required. The delay loop is called via WAIT=2500:GOSUB 1100 in lines 200,800,1010 and 1630 (just change the value assigned to WAIT.

If you do not have or do not wish to use the APX Diskette Librarian, then the output file D1:PROGLIB.DB can be treated simply as a fixed format DOS text file. You may print it directly from DOS using option C (copy file) by typing PROGLIB.DB,P: which will copy the file to your printer. You could also read it into Atariwriter (or any other text processing program), and even ammend the record layout in line 660. But how ever you use BOOTBASE, I hope you have fun!

NOTE: In this program, anything which is underlined, should be entered in 'INVERSE'.

```
RX 1 DIM NAME$(200),D$(4),SIZE$(10),W$(20
   ),S$(1),BUF1$(128),BUF2$(128)
LX 2 DIM R1$(10000),R2$(2000),R3$(500),R4
   $(500)
GW 3 GRAPHICS 0
SN 10 DATA 104,32,83,228,96
QW 20 FOR I=1536 TO 1540
YR 30 READ J:POKE I,J
IS 40 NEXT I
KY 50 POKE 752,1:POKE 709,14:POKE 710,116
   :POKE 712,116:M=0
YP 60 PRINT CHR$(125):? "    MULTIBOOT BO
   OTBASE - By Sol"
AF 70 ? "    ---------------------------"
   :?
BF 80 ? "This program will read the direc
   tory"
BL 90 ? "of your Multiboot disks in Drive
    1.":?
CU 100 ? "You can choose to "
FR 110 ? "          - Print labels"
JT 120 ? "          - Create a Proglib Data
   base"
DM 130 ? "          - Both of the above ."
VP 140 ? :? "Enter your choice (P,C,B)";
TB 150 POKE 764,255:OPEN #1,4,0,"K:"
ZS 160 IF PEEK(764)=21 THEN ? :? :? "You
   have chosen both":C=2:GOTO 200
XZ 170 IF PEEK(764)=10 THEN ? :? :? "You
   have chosen to print labels ":C=1:GOTO
    200
KT 180 IF PEEK(764)=18 THEN ? :? :? "You
   have chosen to create a Proglib":? "Da
   tabase ":C=3:GOTO 200
OM 190 GOTO 160
AV 200 WAIT=2500:GOSUB 1100
SM 205 POS=ADR(BUF1$):PASS=1:SEC=48
BF 206 I=INT(POS/256):J=POS-I*256
ZS 210 POKE 769,1:POKE 770,82:POKE 772,J:
   POKE 773,I:POKE 778,SEC:POKE 779,0
ES 220 IF PASS=2 THEN 340
HJ 300 ? CHR$(125):? "Please put a Multib
   oot disk in D1 ":? "and press RETURN ,
    or * to exit."
CI 310 ?
RM 320 GOSUB 1200
CA 330 ERR=0
EU 340 X=USR(1536):IF PEEK(771)<>1 THEN 1
   000
KY 341 IF PASS=2 THEN 347
WV 342 FOR I=1 TO 128:S$=CHR$(PEEK(POS+I-
   1)):BUF1$(I,I)=S$:NEXT I
CM 346 IF PASS=1 THEN PASS=2:POS=ADR(BUF2
   $):SEC=49:GOTO 206
ZE 347 FOR I=1 TO 128:S$=CHR$(PEEK(POS+I-
   1)):BUF2$(I,I)=S$:NEXT I
TM 350 GOSUB 700
UI 355 IF C>2 THEN 500
IW 360 ? :? "Please ready printer ,":? "a
   nd press RETURN"
UM 370 GOSUB 900
NA 375 CLOSE #3
IS 380 TRAP 2000
WP 385 OPEN #3,8,0,"P:"
SN 390 PRINT #3
SQ 391 PRINT #3
ST 392 PRINT #3
SW 393 PRINT #3
MA 395 PRINT #3;"MULTIBOOT DISK ";D$;" SI
   DE ";S$
WF 396 PRINT #3;"------------------------
   --":PRINT #3
CK 397 PRINT #3;"PROGRAM             SECTO
   RS":PRINT #3
EP 398 FOR I=1 TO N
BV 400 W$=NAME$(I*20-19,I*20)
ZF 405 J=ASC(SIZE$(I,I))
SK 408 PRINT #3;W$;"  ";J
FW 410 NEXT I
HO 411 PRINT #3:PRINT #3;"FREE SECTORS ";
   665-TOT
MP 415 CLOSE #3
UO 420 IF C<2 THEN 205
DB 500 FOR I=1 TO N
TU 510 M=M+1:IF M>500 THEN 1600
US 520 R1$(M*20-19,M*20)=NAME$(I*20-19,I*
   20)
RD 530 R2$(M*4-3,M*4)=D$
XC 540 R3$(M,M)=S$
ZD 550 R4$(M,M)=SIZE$(I,I)
GH 560 NEXT I
OQ 570 GOTO 205
MI 600 IF C<2 OR M=0 THEN 1300
CM 605 ERR=0
YT 610 ? :? "Please insert a DOS 2.0 Data
    Disk":? "in D1. I shall append to a f
   ile"
CR 620 ? "called PROGLIB.DB with ";M;" re
   cords."
PV 630 ? "You can use the PROGLIB databas
   e on"
UJ 640 ? "it for sorting,printing etc."
RU 645 ? :? "Press RETURN when ready ."
UF 650 GOSUB 900:TRAP 2500
WB 651 XIO 36,#4,0,0,"D1:PROGLIB.DB"
GH 652 CLOSE #1:OPEN #1,9,0,"D1:PROGLIB.D
   B"
DL 655 FOR I=1 TO M
XE 656 N=ASC(R4$(I,I)):D$=STR$(N):D$(LEN(
   D$)+1,4)="   ":D$(4,4)="*"
AA 660 PRINT #1;R2$(4*I-3,4*I);R3$(I,I);"
                 ";R1$(20*I-19,20*I);"  M/BO
   OT              ";D$
BS 670 NEXT I:CLOSE #1
WB 680 ? :? "FILE D1:PROGLIB.DB NOW WRITT
   EN"
LK 690 GOTO 1300
SJ 700 N=0:TOT=0:POS=ADR(BUF1$)
BQ 705 FOR I=1 TO 10:IF PEEK(POS-1+I)=0 T
   HEN 720
ZU 710 N=N+1:J=PEEK(POS-1+I):TOT=TOT+J:SI
   ZE$(I)=CHR$(J):NEXT I
YJ 720 IF TOT>665 THEN 800
FJ 730 ST=1
DY 735 FOR I=1 TO N
SO 736 FOR J=1 TO 20
BF 737 IF ST>98 THEN POS=ADR(BUF2$)-128
PZ 740 S$=CHR$(PEEK(POS+29+ST))
BU 741 NAME$(ST)=S$
EM 742 ST=ST+1
FM 745 NEXT J:NEXT I
```

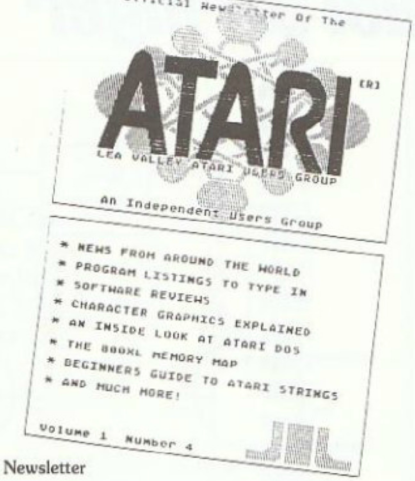
Continued on page 29.

PROFILE ON LEA VALLEY

by Matthew Tydeman.

In 1980 I purchased a 16K Atari 400 for £349, (your not the only one who paid a fortune in those early days) with a 410 cassette player and, of course, the Star Raiders cartridge, the 8K wonder of Atari! Within 6 months I was totally bored with game playing and I began to dig deeper into the possibilities of my computer. Finding out how it worked, and how I could achieve graphics as good as Star Raiders, (great ambition, eh!). Yes, you guessed it, I could'nt! So, where was I to turn? Other users seemed to be my only hope, they must be having the same problems as me I thought. I rushed back to the shop where I had bought my machine and I had a long talk with the proprieter. He gave me the phone number of a man who had asked the same questions only hours before me. I rang, and within 2 months the 'Atari Users Group' was set up, with a member list of 5, including the officials!

At the beginning, Nigel Fowler was the President and I was made Vice-President. This may seem a little odd, but in those early days (before Atari (UK)) instructions on how to form a users group came from the USA, so it is no surprise that the clubs were modelled on the American Presidential system. At the start we could give little help to our members except to discuss games and new releases, (at that time Caverns of Mars was considered to be great!).


Official Newsletter Of The

ATARI (R)

LEA VALLEY ATARI USERS GROUP

An Independent Users Group

* NEWS FROM AROUND THE WORLD
* PROGRAM LISTINGS TO TYPE IN
* SOFTWARE REVIEWS
* CHARACTER GRAPHICS EXPLAINED
* AN INSIDE LOOK AT ATARI DOS
* THE 800XL MEMORY MAP
* BEGINNERS GUIDE TO ATARI STRINGS
* AND MUCH MORE!

Volume 1 Number 4

Newsletter

Slowly we got it together and since then we have gone from strength to strength. We advertised in local shops and newspapers in order to increase our numbers. We did naughty things too, like looking up owners names in shop sales lists, but all in a good cause we feel. Soon, meetings in our homes became too crowded and our only choice was to hire a hall and this is what we did. We rented a small Church Hall and we still hold meetings there to this day.

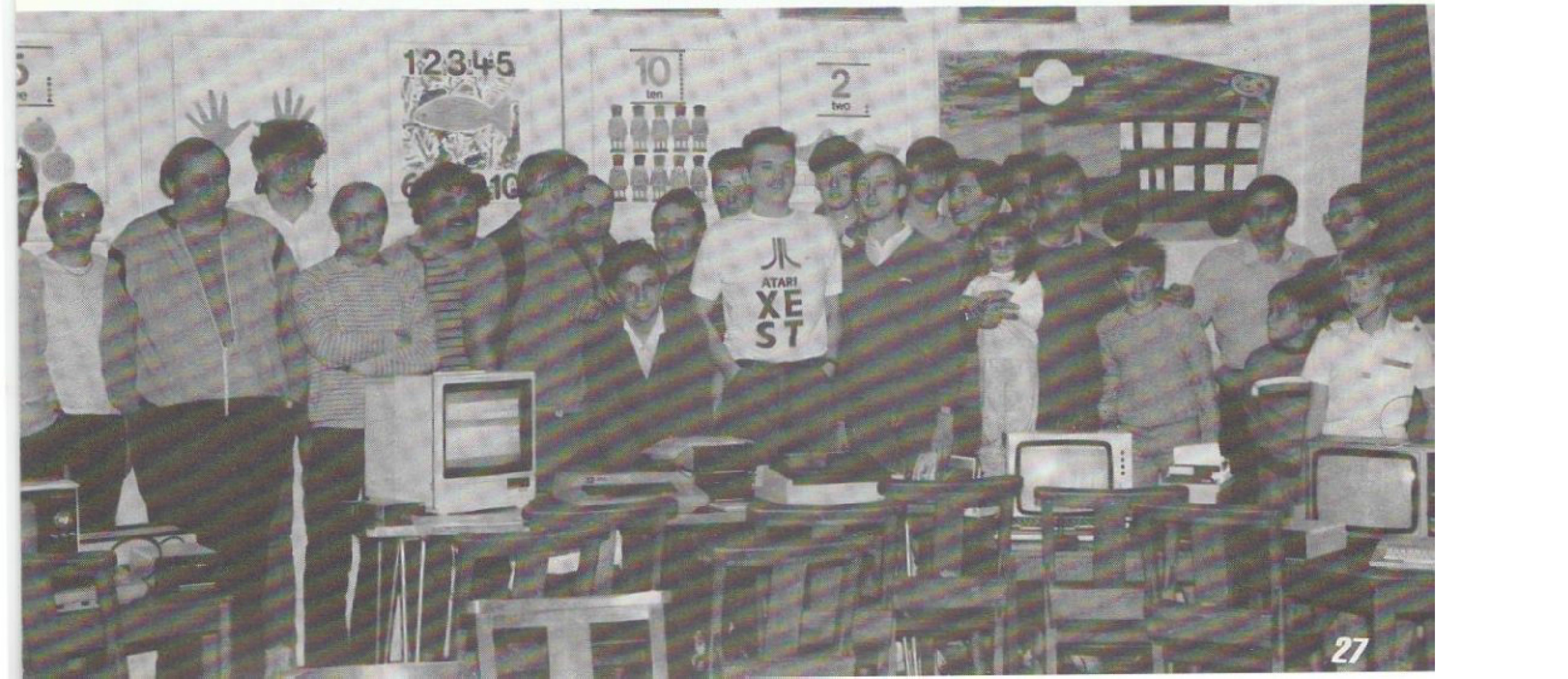
At the meetings, most members were keen to see what software was around and so we had to have 3 or 4 machines constantly running with all the latest on display. Unfortuneatly, at this point, Nigel Fowler had to leave us, (pressure of work) and this meant a new President had to be found. As often happens, nobody wanted the job at the time, but we managed to muddle through with yours truly at the helm for the next six months. Then one night we had a meeting in a local pub (I assure you that this was a one off, Hic!) and Ken Hewitt was voted in as our new President.

From here on it was all uphill, our newsletter got bigger and bigger, (and better and better we hope) increasing from 4 to 20 pages. Our meetings became more regular and our attendance grew by 50%, well almost! We started to give demonstrations of new software of all types; arcade, utilities and educational. We gave help to people with programming problems in Basic and Machine Code, and we now include Logo (Pilot is not supported though, but then its not that popular in the U.K.).

We cater for everyone including youngsters with no knowledge except how to play games, and adults with no knowledge except how to play games (!). We have an age span from 10 to 60, but sadly only 2 lady members. We have members all over the country, and indeed, all over the world, so anything is possible. If you would like to join in the clubs activities and are within attendance distance (London to Hertford) why not call in on us? If you live elsewhere we can arrange a special membership deal (write for details).

Meetings are held at the Church Hall, Church Lane, Wormley (near A10/M25). They are fortnightly, commencing at 7.00 pm until 10.00 pm. Please send a large SAE for details, or phone Waltham Cross 28168 (evenings only), we will be very glad to hear from you. We would also like to hear from other nearby Atari Users Groups so that we could organise a 'Mega-meeting', how about it?

Atari night at the Lea Valley Club



WHAT'S MIDI?

by Michael Stringer Part 1

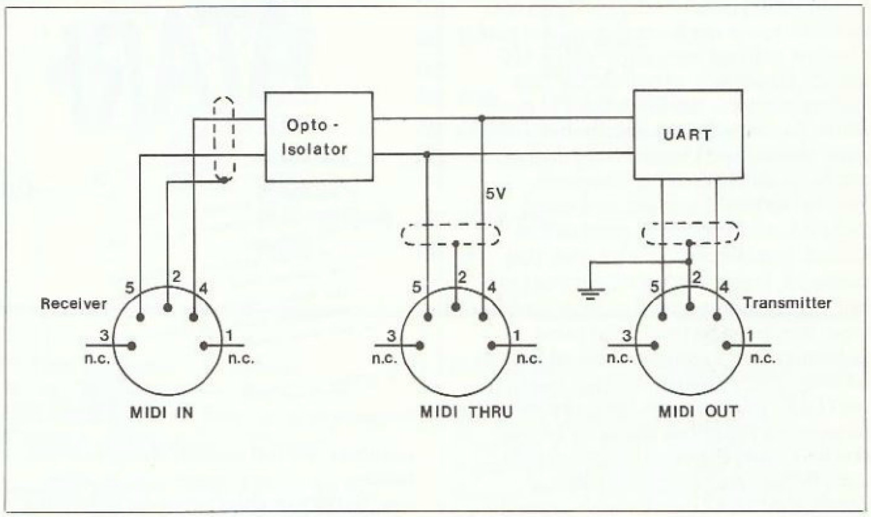


Figure 1

Looking through the specification of the Atari 520ST the other day I noticed that it read '512K RAM, Expandable ROM' and then 'MIDI Interface'. MIDI was placed third in the order of priority, way ahead of such exciting things as 'Hard disk Interface, 16 Bit Motorola Microprocessor running at 8MHz', etc. To be given such a prominent position, it must be pretty important.

MIDI is an acronym for Musical Instrument Digital Interface, which is a Communication Standard for musical instruments and is probably the most important single development devised for the electro-musical fraternity. It allows the hardware of this artform to communicate with itself and also the microprocessor, and in the case of the Atari 520ST, an enormous amount of power is released.

The initial meetings between the major manufacturers began in 1981 and a draught proposal was put forward in April 1983 which gave rise to the MIDI DATA FORMAT. The signatories of this document were Oberheim, Sequential Circuits and Roland, who were also acting on behalf of Yamaha, Korg and Kawai. These manufacturers did not want to fall into the same pit as computer manufacturers, they realised the importance of having a universal instrument interface. Imagine how much more enjoyable it would be if all the manufacturers of, say, 6502 based computers had produced a similar specification for a Basic Language! Anyway, they didn't and we haven't.

The proposal was thrown around a bit and MIDI specification 1.0 was published in August 1983. The first instrument to be manufactured with MIDI incorporated was the Prophet 600 and since then it can be found in Organs, Electric Pianos, Polyphonic Synthesizers, Guitars, Remote Keyboards, Expansion Units, Digital Sound Samplers, Digital Sound Sequencers, Tone Generators, Rhythm Units, Foot Pedals, Electric Drum Sets, the Yamaha CX5 MSX computer and the Atari 520ST. Not bad, for something proposed less than two years ago, and this list is being added to almost daily. Designers are constantly looking for more and more applications in which MIDI can be incorporated.

Is it Limited?

The next question that needs to be answered is, "What can it do"? Before this question can be answered it must be appreciated that MIDI, in its present format, does have its limitations. It will not turn a cheap synthesizer into an all dancing, singing, superduper top line (and very expensive) synthesizer, neither will it turn you into the greatest musician since Wolfgang Amadeus Mozart, but it will certainly open up a new, and very absorbing, world if you have any musical interest. The extent of its possibilities will be limited by the software availability. If, for example, you have a touch-sensitive synthesizer, there is no doubt that the Atari 520ST will be able to teach you to play correctly. This is because the synthesizer will be able to communicate with the computer, as well as the computer communicating to the synthesizer. The computer will know exactly which note you have played in response to a given text and it will know exactly how you played the note. All the information regarding note, key velocity and pressure is sent out from the keyboard and can be analysed very critically.

If learning to play does not appeal to you, it is still possible to utilise the other applications, such as linking a synthesizer to the computer and letting the computer play scores, or store real time information from the keyboard, if you can already play. The computer can synchronise other synthesizers and ancillary apparatus, such as rhythm units, sequencers, in fact anything from the list given earlier, up to a maximum of 16. The only proviso in this instance is that only one voice, or channel is dedicated to each peripheral.

The two essential features of MIDI are the Interface and the Control Data. In Figure 1 can be seen, in a simplified manner, the important features of the Interface. As far as the user is concerned, it consists of three ports. These are known as MIDI IN, MIDI OUT, and MIDI THRU (yes it is another American word we are stuck with!). These are standard 180 degree 5 pin female DIN sockets. The Atari 520ST only has two sockets, MIDI OUT and MIDI IN.

The fact that there is only one pair of sockets is a very limiting feature, but more about that at a later stage. There is no need

for a controlling device to have MIDI THRU, which is why there are only two sockets to be found tucked at the back of the computer.

MIDI DATA is Asynchronous, Serial, operating at 31.25 Kbaud, which is why MIDI data can be sent via DIN hardware, because it is obviously cheaper to manufacture than it would be if the data was sent parallel. The three modes of data transfer are MIDI IN, which receives data, MIDI OUT which transmits data and MIDI THRU provides a buffered output of data received from MIDI IN, allowing data to be sent to the next piece of apparatus in a Train Network.

The interface is a 5mA current loop, which is opto-isolated. The two states of the data, HIGH (1) and LOW (0) produce current changes in the circuit. When the data state is LOW, current flows through the opto-isolator, effectively grounding the 5V normally sent to the UART, causing the UART to see a logic LOW. When the logic data goes HIGH, the opto-isolator does not conduct and, therefore, the UART sees logic HIGH. There is no ground connection between a transmitter and receiver. The screened cable from the MIDI IN socket is not connected to the opto-isolator (pin 2). It can be seen from the diagram that on all the sockets, pins 1 and 3 are not used. The maximum length of cable that can be used is 15 M (49 Feet).

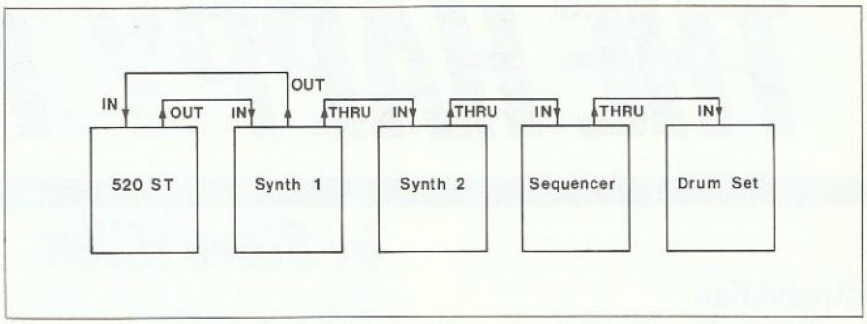


Figure 2

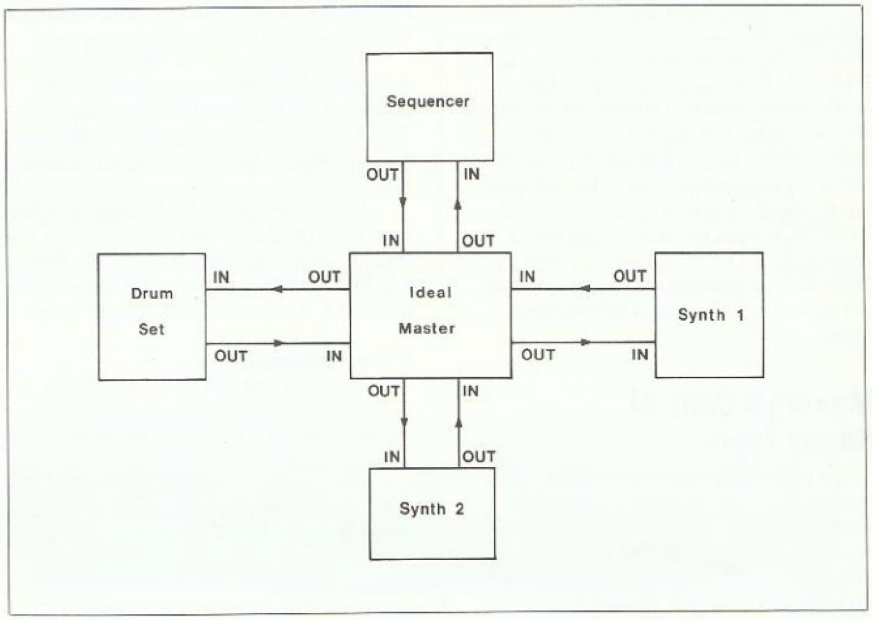


Figure 3

Systems

There are two ways of networking a system, these can be called the Train and the Wheel. Typical examples are shown in Figures 2 and 3. Figure 2, is a possible arrangement using a Train Network. The 'Master' controller could be the Atari 520ST, for example. Two-way communication is only possible with one of the peripherals, here it is connected to Synth 1. Data from the Master is transmitted to the MIDI IN of Synth 1 and the MIDI THRU from this connection is forwarded to the next peripheral. The MIDI OUT of Synth 1 is connected to the MIDI IN of the Master. It can be seen immediately from this arrangement there is a severe restriction enforced by having only one set of MIDI sockets. There is a very cramped utilisation of the full potential of the Master. MIDI is a two-way communication system, and it can be seen that only one peripheral can utilise this facility.

It is a great pity, that in their infinite wisdom, Atari could not have put some extra MIDI outputs on the 520ST to take full advantage of the tremendous power that is available. This would enable a Wheel Network to be set up. In Figure 3, a typical Wheel Network is shown. This is without doubt the best arrangement to have, all the peripherals can communicate with each other, utilising to the full, the enormous potential that MIDI can provide. If Atari had increased the number of outlets it would have turned a great computer into an outstanding one!

Next time we will look at the Data Format and the structure of the MIDI Language.

Bootbase

Continued from page 26.

```
YY 750 POKE 764,255:? "ENTER DISK # (4 CH
   ARS)"
QQ 755 INPUT D$:IF D$="" THEN 755
TU 756 ? "ENTER SIDE (A,B)"
KS 757 INPUT S$:IF S$="A" OR S$="B" THEN
   760
UL 758 GOTO 757
HT 760 IF LEN(D$)=4 THEN 780
KI 770 D$(LEN(D$)+1,4)="   "
ZT 780 RETURN
NR 800 ? :? "THIS IS NOT A VALID MULTIBOO
   T DISK":WAIT=2500:GOSUB 1100:POP :GOTO
    205
WP 900 POKE 764,255
JN 910 IF PEEK(764)<>12 THEN 910
ZJ 920 RETURN
LG 1000 ERR=ERR+1:IF ERR<5 THEN 340
NG 1010 ? :? "Error in reading your Multi
   boot disk":? "Please check it and re-t
   ry":WAIT=2500
ZP 1020 GOSUB 1100:GOTO 205
XK 1100 FOR I=1 TO WAIT:NEXT I:RETURN
FV 1200 POKE 764,255
ZG 1210 IF PEEK(764)=7 THEN 600
UW 1220 IF PEEK(764)<>12 THEN 1210
AM 1230 RETURN
XG 1300 ? :? "THANK YOU FOR USING BOOTBAS
   E"
OR 1310 ? :? "BYE FOR NOW":POKE 580,1:CLO
   SE #1:OPEN #1,4,0,"K:":? :? :? :? :? :
   GOTO 3000
QU 1600 ? :? "500 ENTRIES IS THE MAXIMUM"
CV 1610 ? "FOR SAVING TO D:PROGLIB.DB"
PE 1620 ? :? "LIMIT NOW REACHED !"
WL 1625 ? "(You have a lot of programs ..
   .)"
NJ 1630 WAIT=2500:GOSUB 1100:GOTO 205
UX 2000 ? :? "ERROR IN PRINTING":? :GOTO
   360
OW 2500 ERR=ERR+1:TRAP 2500:IF ERR>1 THEN
    2510
OX 2505 CLOSE #1:OPEN #1,8,0,"D1:PROGLIB.
   DB":GOTO 652
CI 2510 ? :? "ERROR IN ACCESSING DOS 2.0
   DATA DISK":? :GOTO 605
OE 3000 ? :? "PRESS RETURN TO RE-BOOT":PO
   KE 752,1:GOSUB 900:X=USR(58487)
```

THE HAPPY TYPER

by Steve Hillen

Introduction

The Happy Typer is a utility for use with Atari Basic. It will give you automatic intelligent line-numbering and 10 extra keys which you can redefine to print out keywords, thus speeding up your typing. Unlike many auto line numbering facilities, this one allows the full use of the Atari screen editor, so you can adjust lines while still in the auto mode. The redefined keys are accessed by pressing the SHIFT and CONTROL keys simultaneously with a number key. These keys are not used by Basic or the operating system, so you can still type in all those control characters safely.

Making a Copy of Happy Typer

If you are using a cassette only system, then type in listing 1 using Basic. Save out this program before doing anything else. Type RUN and the program will check your typing and ensure that the data is correct. Retype those lines that produce an error. Once all is correct, the program will prompt you to ready a new cassette. On typing RETURN the program will save out an autoboot file which is the Happy Typer. Load this file by pressing START on power-up with Basic. Happy Typer will load, tell you that it's OK, and be ready for use.

If you are using a disk system, type in listing 2 and save it out. RUN it and correct any mistakes found by the program. Once it's ready, the program will ask you to insert a disk with DOS on it. The program will then save out an Autorun.Sys file onto the disk. Don't change the filename – Happy Typer will only work as an Autorun.Sys file. The next time you boot this disk with Basic, Happy Typer will be ready for use.

Using Happy Typer

1-The Auto Line Numbering

Every time you tap the TAB key after a RETURN, a new line number will be printed. If you type on the TAB key and the last key pressed was not a RETURN then the TAB will be performed as normal. This is better illustrated by example.

Directly after power-up, press the TAB key – the first line number will be printed. Type ?"hello" then RETURN then TAB. The next line number will then appear. Play around and get used to using the TAB key after a RETURN. If you type in a few lines of Basic, then list them, then press RETURN and TAB, the next line number after the last line of your program is printed. Also, if you use the cursor keys to move to another line, and press RETURN on that, then the next auto line number will be that plus 10.

This method of auto line numbering remembers the last line you typed, and gives you the next one if selected with the TAB key. If you want to type in a new number, just do so without using the TAB key.

Finally, to change the increment of the auto line numbering. just type:
INC nn where nn is any number you like. e.g. INC 2000 will give line numbers 2000 apart, INC 1 will give numbers one apart.

2-The Redefined Keys

The keys that can be redefined are the row of 10 numbers across the top of the keyboard. To redefine a key type:
DEF 1 ?"hello"

Every time you type SHIFT CONTROL 1 simultaneously, ?"hello" will be printed. Another example: DEF 8 POKE. Now a shift-control 8 will type out POKE for you. Get the idea?

Note that the space between DEF,1, . and the string are important. Also note that each key is allocated only 16 characters, so this is the maximum you can stuff onto one key. If you redefine a key that has already been redefined, then the last redefinition will be printed. If you should wish to delete a key just type DEF 1 then RETURN without the second space. You will find that all characters except trailing spaces and the return key can be printed, so you might set up one key to backspace say 10 characters by using the Escape Cntl cursor keys.

Finally, don't worry about hitting the System Reset key, the program is safely installed and protected, and will remember all the keys you've defined, and the increment and current line number.

How does it work?

The program falls into two sections. Firstly there is an editor patch. The editor is located in the device table, and its vectors are moved into RAM. I adjust the get-byte vector to point to my new routine. This new routine waits for a return to be typed then scans the input buffer for either INC or DEF. If neither are found then the line is passed back to Basic as a normal line. If one is found, then the operation is performed, and the line is not passed to Basic. The second section is a patch into the keypress routine. The keypress interrupt vector is stolen and the new routine looks for a shift-control number or a TAB immediately following a return. If a defined key is detected, then the string is printed out a byte at a time through the editor put-byte routine. If a TAB is found, then the input buffer is examined for a line number and the increment is added to form the next number which is then printed via the put-byte routine.

The program is just over 3 pages long and protects itself by altering MEMLO. Don't change MEMLO or poke anywhere beneath it!

Note that this is only an editing aid and is irrelevant when running the program. The cassette version loads over pages 7-10, and the disk version loads over pages 31-34, so page 6 is left free for your own use.

Happy Typing!

Listing 1

```
EI 1 REM *******************************
NH 2 REM
BZ 3 REM HAPPY TYPER (CASSETTE VERSION)
NJ 4 REM
TF 5 REM BY STEVE HILLEN
NL 6 REM
ZT 7 REM MONITOR MAGAZINE 1985
NN 8 REM
EQ 9 REM *******************************
DW 10 DATA 0,1,2,3,4,5,6,7,8,9,0,0,0,0,0,
   0,0,10,11,12,13,14,15
MM 15 DIM DAT$(91),HEX(22)
KZ 20 FOR X=0 TO 22:READ D:HEX(X)=D:NEXT
   X:LINE=990:RESTORE 1000:TRAP 60:? "Che
   cking data":PRINT
LI 25 LINE=LINE+10:? CHR$(28);"Line:";LIN
   E:READ DAT$:IF LEN(DAT$)<>90 THEN 110
VD 28 DATLINE=PEEK(183)+PEEK(184)*256:IF
   DATLINE<>LINE THEN ? "Line :";LINE;" m
   issing.":END
LU 30 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X,
   X))-48:D2=ASC(DAT$(X+1,X+1))-48:BYTE=H
   EX(D1)*16+HEX(D2)
JW 35 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
   EAD CHKSUM:GOTO 25
BL 40 TOTAL=TOTAL+D1+D2+96:IF TOTAL>999 T
   HEN TOTAL=TOTAL-1000
CE 45 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
   THEN 25
ME 50 GOTO 110
PE 60 IF PEEK(195)<>6 THEN 110
IT 65 IF PASS=2 THEN CLOSE #1:? "Done it.
   ":END
UE 70 ? "Ready cassette and press <return
   >";:OPEN #1,8,128,"C:"
```

```
HH 90 PUT #1,255:PUT #1,255:PUT #1,0:PUT
   #1,31:PUT #1,176:PUT #1,34
CN 100 ? "Writing file":? :? :PASS=2:LINE
   =990:RESTORE 1000:TRAP 60:GOTO 25
AZ 110 ? "Bad data on line:";LINE:LIST LI
   NE:? TOTAL:END
PE 1000 DATA 000880060007A93C8D02D3A90C8D
   150AA9008D4402A200A9099D4203A9069D4503
   A9B59D4403A9009D4903A97F,990
DR 1010 DATA 9D48032056E41860486170707920
   5479706572204F4B2E9B000000000000000000
   000000000000000000000000,610
SK 1020 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   0000000000D8A94B8DE702A9,90
HO 1030 DATA 0A8DE802A200BD1A03E8E8E8C945
   D0F6BD180385CBBD190385CCA9189D1803A90A
   9D1903A00FB1CB99180A8810,255
KS 1040 DATA F8AD1C0A1869018D4D08AD1D0A69
   008D4E08A9088D1D0AA94B8D1C0AAD1E0A1869
   018D0A09AD1F0A69008D0B09,430
WK 1050 DATA 78AD08028DA207AD09028DA307A9
   078D0902A97B8D080258186078D88A48984BAC
   150AAD09D28D150AA209DD41,518
ZJ 1060 DATA 0AF013CA10F8C92CD004C00CF02B
   68A868AA584CFFFFBD6109F01B8D60098A0A0A
   0A0AAA8E5F09BD6B09200909,733
NQ 1070 DATA AE5F09E8CE6009D0EE4C9C07A2FF
   E8BD0B0AC930F0F88E160A200909EE160AAE16
   0ABD0B0AE00590F0A9218DFC,8
HL 1080 DATA 0268A868AA685840A2FFE83056BD
   8005C920F0F6C930F0F29049C93AB045E8A000
   990B0ABD8005297FC930900C,108
ZM 1090 DATA C93AB008E8C8C00590EAF014A204
   B90B0A9D0B0ACA8810F6A9309D0B0ACA10FA18
   A204BD100A7D0B0AC93A9003,265
AB 1100 DATA E90A389D0B0ACA10ED6020FFFF08
   C99BD0388A4898487820F0075BA2008E400AA0
   00B98005DD280AD008E8C8C0,396
YY 1110 DATA 0390F2B01DC8E8C003D0FAEE400A
   E00590E1A9FF8D170A68A868AAA99BEE170A28
   60AC170AA99B9980058D8005,580
AH 1120 DATA AE400ABD300A8DD308BD2E0A8DD4
   0820D208A2008E170A901AA9099D42038E4903
   A97F9D4803A90A9D4503A932,678
GY 1130 DATA 9D44032056E44C4DA04CFFFFA0FF
   C8B98405C99BF00BC9309004C93A90F038B01E
   8830FAA204B98405290F9D10,840
CR 1140 DATA 0ACA8810F4E0003008A9009D100A
   CA10FA186020FFFF60A004B98005C9309046C9
   3AB04238E930480A0A0A0AAA,889
LU 1150 DATA A9008D5E09C8B98005C99BD00968
   AAA9009D6109F021C8B98005C99BF0119D6B09
   E8EE5E09AD5E09C91090EACE,95
WC 1160 DATA 5E0968AAAD5E099D610918603860
   00000000000000000000000000000000000000
   000000000000000000000000,647
DK 1170 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   000000000000000000000000,967
JZ 1180 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   000000000000000000000000,287
UC 1190 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   000000000000000000000000,607
DM 1200 DATA 0000000000000030303031300000
   00010000000000000000000000000000000000
   000000494E434445460809D5,58
DU 1210 DATA 0D53796E746178206572726F722E
   9B00F2DFDEDAD8DDDBF3F5F000000000000000
   000000000000000000000000,924
```

Listing 2

```
EI 1 REM ******************************
NH 2 REM
WE 3 REM HAPPY TYPER (DISK VERSION)
NJ 4 REM
TF 5 REM BY STEVE HILLEN
NL 6 REM
ZT 7 REM MONITOR MAGAZINE 1985
NN 8 REM
EQ 9 REM ******************************
DW 10 DATA 0,1,2,3,4,5,6,7,8,9,0,0,0,0,0,
   0,0,10,11,12,13,14,15
MM 15 DIM DAT$(91),HEX(22)
KZ 20 FOR X=0 TO 22:READ D:HEX(X)=D:NEXT
   X:LINE=990:RESTORE 1000:TRAP 60:? "Che
   cking data":PRINT
LI 25 LINE=LINE+10:? CHR$(28);"Line:";LIN
   E:READ DAT$:IF LEN(DAT$)<>90 THEN 110
VD 28 DATLINE=PEEK(183)+PEEK(184)*256:IF
   DATLINE<>LINE THEN ? "Line :";LINE;" m
   issing.":END
LU 30 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X,
   X))-48:D2=ASC(DAT$(X+1,X+1))-48:BYTE=H
   EX(D1)*16+HEX(D2)
JW 35 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
   EAD CHKSUM:GOTO 25
BL 40 TOTAL=TOTAL+D1+D2+96:IF TOTAL>999 T
   HEN TOTAL=TOTAL-1000
CE 45 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
   THEN 25
ME 50 GOTO 110
PE 60 IF PEEK(195)<>6 THEN 110
IL 65 IF PASS=2 THEN PUT #1,224:PUT #1,2:
   PUT #1,225:PUT #1,2:PUT #1,78:PUT #1,3
   4:CLOSE #1:? "Done it.":END
HN 70 ? "Insert disk with DOS.Press (retu
   rn).";:DIM IN$(1):INPUT IN$:OPEN #1,8,
   0,"D:AUTORUN.SYS"
HH 90 PUT #1,255:PUT #1,255:PUT #1,0:PUT
   #1,31:PUT #1,176:PUT #1,34
CN 100 ? "Writing file":? :? :PASS=2:LINE
   =990:RESTORE 1000:TRAP 60:GOTO 25
AZ 110 ? "Bad data on line:";LINE:LIST LI
   NE:? TOTAL:END
FC 1000 DATA 20FFFFD8A94E8DE702A9228DE802
   A200BD1A03E8E8E8C945D0F6BD180385CBBD19
   0385CCA91B9D1803A9229D19,243
HV 1010 DATA 03A00FB1CB991B228810F8AD1F22
   1869018D5020AD202269008D5120A9208D2022
   A94E8D1F22AD21221869018D,232
XY 1020 DATA 0D21AD222269008D0E2178AD0802
   8DA51FAD09028DA61FA91F8D0902A97E8D0802
   58186078D88A489848AC1822,310
AK 1030 DATA AD09D28D1822A209DD4422F013CA
   10F8C92CD004C00CF02B68A868AA584CFFFFBD
   6421F01B8D63218A0A0A0A0A,501
XP 1040 DATA AA8E6221BD6E21200C21AE6221E8
   CE6321D0EE4C9F1FA2FFE8BD0E22C930F0F88E
   1922200C21EE1922AE1922BD,707
EP 1050 DATA 0E22E00590F0A9218DFC0268A868
   AA685840A2FFE83056BD8005C920F0F6C930F0
   F29049C93AB045E8A000990E,823
XK 1060 DATA 22BD8005297FC930900CC93AB008
   E8C8C00590EAF014A204B90E229D0E22CA8810
   F6A9309D0E22CA10FA18A204,926
CD 1070 DATA BD13227D0E22C93A9003E90A389D
   0E22CA10ED6020FFFF08C99BD0388A48984878
   20F31F58A2008E4322A000B9,31
GS 1080 DATA 8005DD2B22D008E8C8C00390F2B0
   1DC8E8C003D0FAEE4322E00590E1A9FF8D1A22
   68A868AAA99BEE1A222860AC,229
RO 1090 DATA 1A22A99B9980058D8005AE4322BD
   33228DD620BD31228DD72020D520A2008E1A22
   901AA9099D42038E4903A97F,251
SK 1100 DATA 9D4803A9229D4503A9359D440320
   56E44C4DA04CFFFFA0FFC8B98405C99BF00BC9
   309004C93A90F038B01E8830,393
AB 1110 DATA FAA204B98405290F9D1322CA8810
   F4E0003008A9009D1322CA10FA186020FFFF60
   A004B98005C9309046C93AB0,427
IB 1120 DATA 4238E930480A0A0A0AAAA9008D61
   21C8B98005C99BD00968AAA9009D6421F021C8
   B98005C99BF0119D6E21E8EE,543
DU 1130 DATA 6121AD6121C91090EACE612168AA
   AD61219D64211860386000000000000000000
   000000000000000000000000,215
TM 1140 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   000000000000000000000000,535
NH 1150 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   000000000000000000000000,855
TW 1160 DATA 0000000000000000000000000000
   00000000000000000000000000000000000000
   000000000000000000000000,175
GO 1170 DATA 0000000000000000000000000000
   00000030303031300000000100000000000000
   000000000000000000000000,512
AF 1180 DATA 00494E434445462021D81053796E
   746178206572726F722E9B00F2DFDEDAD8DDDB
   F3F5F0A90C8D1822A50C8D01,620
JT 1190 DATA 1FA50D8D021FA900850CA91F850D
   A9008D4402A200A9099D4203A9229D4503A98B
   9D4403A9009D4903A97F9D48,684
HR 1200 DATA 032056E44C031F48617070792054
   797065722 04F4B2E9B00000000000000000000
   000000000000000000000000,297
```

BACK ISSUES

Previous issues of this magazine are obtainable from the club for £1 plus 30p postage each. They contain many interesting and informative articles, hints & tips, program listings for you to input, reviews and practical advice. If you have missed out send for your copies of back issues today! Please note that issues 1,2,3 & 7 are already sold out.

Issue 4.

Includes a complete in-depth look at Display Lists, what they are, how to use them, LMS explained, horizontal and vertical scrolling, etc. Another article shows how to get text on a Graphics 8 screen and gives an example graph to prove the point. A comprehensive review of many of the different types of joystick that are available gives ratings for comfort, action, looks and value. Program listings are aplenty and include 'Peckman' a Basic version of a well known arcade game, Stunt Rider in which you must jump your motorbike over the buses, Hex is a two player board game with excellent graphics, and for the more serious minded, you can even enjoy designing your own shapes with CAD (computer assisted design).

Issue 5.

The first part of the series on 'Cracking the Code' starts in this issue and covers Binary, Hexadecimal and Decimal mathematics. There is an article on protecting your Basic programs from prying eyes and an interesting article on hardware modifications to the 800/400 machines to give improved sound and picture quality, a cold start key and a busy light for your cassette player. Also included is a review of the new programming language 'Action!' showing its potential for creating exciting fast action games. Games listings shown include Gil-bert, which is a 'Q-bert' type game, also Dragonfire in which the player must cross the drawbridge dodging the dragons flaming breath to reach the treasure room. Other listings include a label maker and a QRA locator for Radio Amateurs.

Issue 6.

Includes a useful tutorial showing how to print Micropainter and Versawriter pictures, also contains a terrific program demonstrating 80 characters across the screen. A new regular column for adventure enthusiasts is started to give reviews of adventure games and give hints and tips on how to play them. Part two of Cracking the Code continues with addresseing modes and binary sums. The hardware design for a Light Pen is shown together with some simple programs to use with it once you have built it. Fun with Art from Epyx is reviewed and some of the excellent results of using this package are shown. Programs include Planetron and a RTTY listing for use with a short wave band radio, the Atari 850 interface and a signal terminal unit (such as the Maplin TU1000).

Issue 8.

Contains a preview of the new Atari computers. Two new series start, one about how files work and the other 'Starting from Basics' for beginners. Cracking the code continues and the concluding part of 'Interrupts' discusses horizontal and vertical scrolling. The adventure column includes reviews of Mask of the Sun and Sorcerer. Other reviews include Conan, Spy vs Spy, Alley Cat and Ghostbusters. Programs are Matchbox, a concentration game, Quick-plot, a Graphics 8 Plot/Drawto utility and Nightmare Reflections, an exceedingly frustrating adventure.

Cracking the Code

Continued from page 21.

equal' (BEQ) instruction will take us to EXIT which returns to BASIC. The test is made first in case the multiplier is zero, if so then the result will also be left as zero. Assuming the multiplier isn't zero then lines 320 to 350 clear the carry and add the multiplicand to the low byte of the result. If the carry is left clear then a branch is made to NOCARY, else one is added to the high byte of the result by the increment instruction on line 370. This method of seeing if the carry is set and then incrementing the high byte by one is exactly the same as adding with carry (ADC) zero to the high byte, however, this would require a load and a store instruction, thus we save two bytes! All that happens then, is one is taken from the count by the decrement X instruction and a jump is made back to the comparison instruction at MLTPLY to continue the multiplication. The loop will continue like this until the count in the X register has been taken to zero, once this happens it will return to BASIC and the answer, held at RESULT and RESULT+1, will be placed into BASIC's variable.

Listing 7

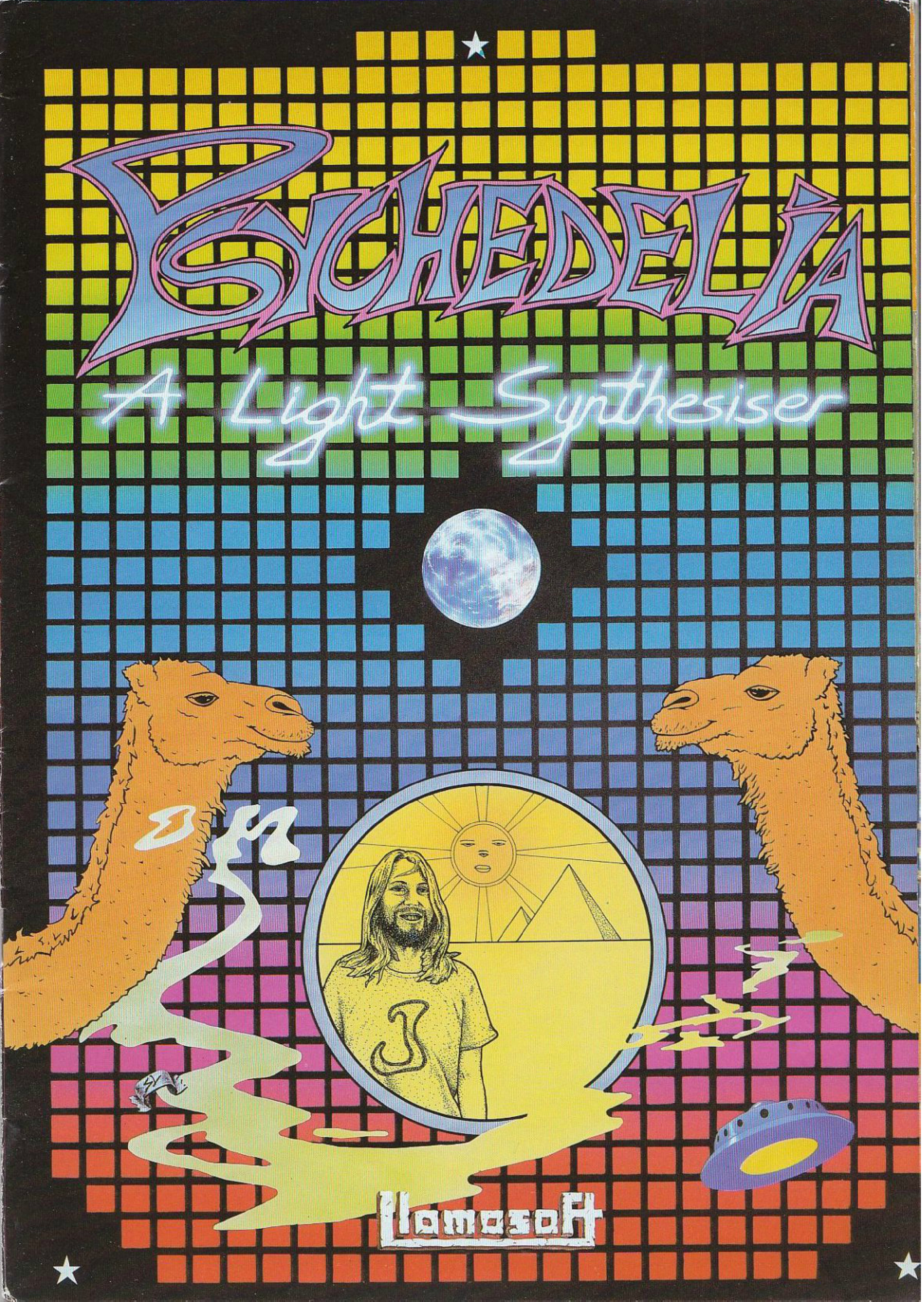
```
10 DIM HEX$(16)
20 LINE=10000:TRAP 100
30 READ HEX$,CHKSUM:SUM=0:J=0:START=
1536
40 FOR I=1 TO 15 STEP 2
50 D1=ASC(HEX$(I,I))-48:D2=ASC(HEX$(
I+1,I+1))-48
60 NUM=((D1-7*(D1>16))*16+(D2-7*(D2>
16)))
70 SUM=SUM+NUM:POKE START+J,NUM:J=J+
1:NEXT I
80 IF SUM=CHKSUM THEN LINE=LINE+10:G
OTO 30
90 PRINT "Checksum error on this lin
e:"
95 LIST LINE:END
100 PRINT "Data in memory."
10000 DATA 68686885CB6868AA,1026
10010 DATA C5CB9005A5CB86CB,1254
10020 DATA AAA90085D485D5E0,1254
10030 DATA 00F00F18A5D465CB,960
10040 DATA 85D49002E6D5CA4C,1212
10050 DATA 1706600000000000,125
```

Running the Program

To run the program it will have to be in the locations starting at 600 hex (page 6). If you assembled your own copy of this program then you could load the object file into memory, for disk owners life is simple, just nip into DOS and binary load the object file, then jump back to BASIC.
If you are using the assembler editor cartridge with cassette then beware of an error. You cannot CLOAD the object file as is stated in the manual, instead you will need a short routine (see the one on page 8 of issue 6), such utility routines will be delt with in the next part of this series.
If you can't load your object program or don't have an assembler yet, then Listing 7 is a BASIC program which reads the hex data and stores them in memory after they have been converted to decimal for the POKE statement, if you have made a mistake in the data a 'checksum error' will be printed out, if so, then re–check the DATA statements. Having saved the program, type RUN and the machine code in the data will be poked into memory, after a short delay the message 'Data in memory' will be displayed. You can now test it by typing:
ANSWER=USR(1536,10,24)
then typing: ?ANSWER will give the result of 240. You can change the two parameters, but don't alter the first number of 1536, this is the decimal for 600 hex, which is the start of the program.

Until Next Time...

In the next issue I will tie up some loose ends, including looking at an improved multiplication routine, and then start some new programs and topics. Have fun experimenting until then, and if you haven't already done so, rush out and buy that assembler you were promising yourself!


Psychedelia
A Light Synthesiser
Llamasoft

ATARI ST

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 18 key numeric keypad), MIDI interface, GEM and a 500K 3½ inch disk drive, all for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizeable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS -Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned; Atari will soon be releasing a 1000K (1MB) 3½ inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disk (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00 This price includes:

- ★***512K RAM***
- ★***MOUSE***
- ★***GEM***
- ★***B/W MONITOR***
- ★***500K 3.5" DISK DRIVE***
- ★***KEYBOARD (95 KEYS)***

£749

ATARI 520ST SPECIFICATION

MEMORY
512K RAM (524,288 bytes)
16K ROM expandable to 320K
Port for addnl 128K plug-in ROM cartridges
200K TOS operating system

GRAPHICS
Individually addressable 32K bit-mapped screen with 3 screen graphics modes:
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of grey in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

ARCHITECTURE
4 custom designed chips:
GLUE Chip - MMU Memory Mngmnt Unit
DMA Controller - Graphics Processing Unit
16/32 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
16 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access 1.33 Mbytes per second
CD (Compact Disc) interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) s/sided 3½" floppy d/drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate keyboard microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad — 18 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum Baud Rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Virtual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment
with user friendly Macintosh style operation
'TOS' - Tramiel Operating System
Atari's own system based on CP/M 68K with hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
'BOS' - Business Operating System
to run any standard BOS business programs
GEM desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo
originally written by Digital Research (DR) Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions: 470mmx240mmx60mm
Replaceable external power supplies
Expansion: 3½" floppy disk drives 500K/1,000K
(two drives can be connected)
3½" 15Mb hard disk
CD (compact laser disc)
Dot matrix & d/wheel prntrs (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including: Assembler, BCPL, C, Cobol, Compiled Basic Lisp, Modular-2 and Pascal

Note: Some of the above specifications are pre-release and may therefore be subject to change

MACINTOSH v F1e v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, cursor and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third of the price."
June 1985 - Jack Schofield - **PRACTICAL COMPUTING**

	APPLE	APRICOT	ATARI
FEATURES OF BASIC SYSTEM	MACINTOSH	F1e	520ST
Price Includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x60
Keyboard size ins (LxDxH)	13x5¾x2	17½x6½x1	18½x9½x2½
3½" D/Drive (Unformatted)	500K	500K	500K
3½" D/Drive (Formatted)	399K	315K	349K
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232 Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (18 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse Included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES

System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive

Price of basic system (exc VAT)	£2595+VAT	£595+VAT	£652+VAT
+ Mouse	Included	£95+VAT	Included
+ Monochrome Monitor	Included	£200+VAT	Included
+ Expansion to 512K RAM	Included	£295+VAT	Included
Price of complete system (exc VAT)	£2595+VAT	£1185+VAT	£652+VAT
PRICE rounded down including VAT	£2,984	£1,362	£749

PRESS COMMENT

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Mr. Tramiel established the maxim that 'Business is war'."
August 21st 1984 **FINANCIAL TIMES**

"This is the only personal computer I know of that comes with a Midi interface as standard."
Peter Bright March 1985 **PERSONAL COMPUTER WORLD**

"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing." April 6th 1985 **PERSONAL COMPUTER NEWS**

"It would seem that GEM offers the ideal operating system."
March 7th 1985 **POPULAR COMPUTING WEEKLY**

"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 **PERSONAL COMPUTER WORLD**

"The electronics in the machine are a work of art ... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip ... when the machine appears in the shops, I'll be at the front end of the queue to buy one."
Peter Bright June 1985 **PERSONAL COMPUTER WORLD**

"This machine is significantly more powerful than an IBM PC ... If it's possible to design a sure-fire winning machine, this is it."
May 11th 1985 **PERSONAL COMPUTER NEWS**

"... the use of GEM makes the new range of Atari computers so similar to the Macintosh (with the added attraction of colour), that they are already being called 'Jackintoshes'."
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"The new Atari ST computers truly represent to the consumer what Jack Tramiel is saying — easy-to-use computing power without the price." March 1985 **ANALOG COMPUTING**

"It (the ST) uses the most modern technology that is affordable, in a package that gives a professional impression."
May 23rd 1985 **POPULAR COMPUTING WEEKLY**

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