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FOR LOCKSMITH**

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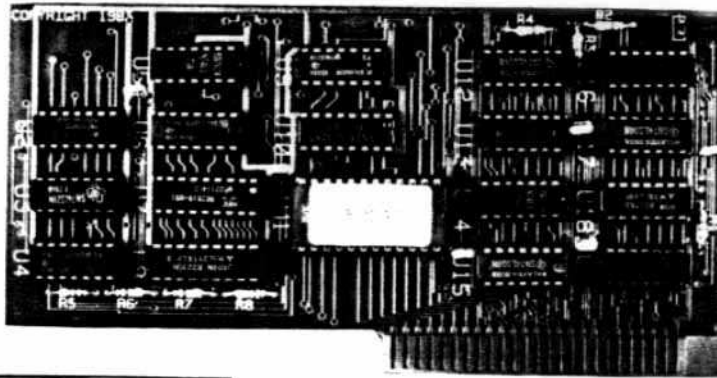


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REPLAY II is an interface card that is slot independent. Users can stop a program, examine and change memory, or copy the program, and restart. Control of the APPLE is obtained by pressing the remote switch which comes on an 18 inch cord outside the APPLE. REPLAY II does not copy the original disk, rather it copies the program executing in memory. If a copy is desired a blank disk is inserted in drive 1 and the options on the menu are contained in the eeprom on the REPLAY II card, no other disk needs to be booted for copying, unlike other copy cards. The very act of booting another disk alters memory which is detectable by some protected software.

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Minimum requirements are an APPLE II and a single disk drive.

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for the serious Apple-user and hard-core **computist 2**

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PARAMETERS

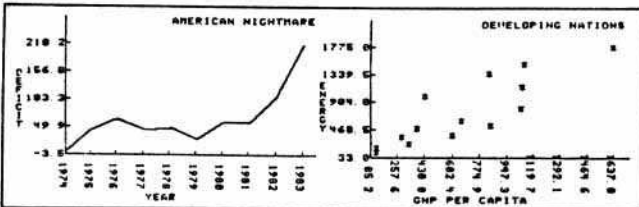
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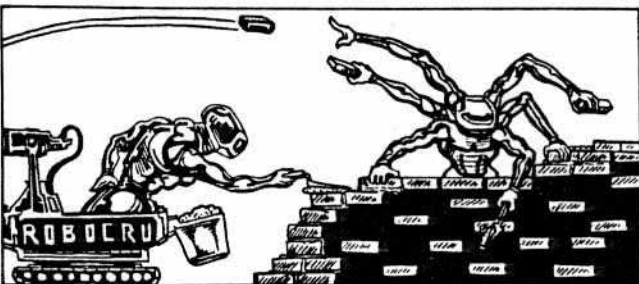
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Checksums for binary listings are found alongside the actual listing, to the right of a dotted line. Checksums for Applesoft are listed separately. More information on Softkey's Checksums can be found in *HARDCORE COMPUTIST* #1. To order back issues, send \$2.50 (plus \$1.00 for postage in North America; \$2.00 for all others) to *HARDCORE*, P.O. Box 44549, Tacoma, Washington 98444.

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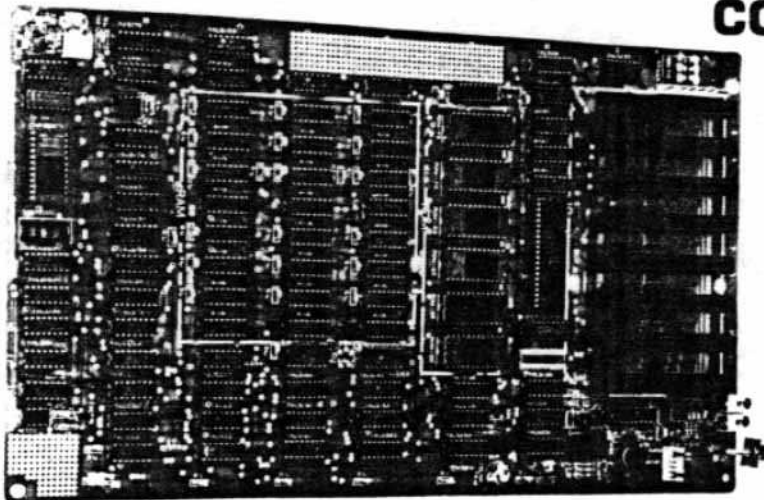
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INPUT INPUT INPUT

Pirated "Hardcore" Leads to Subscription

In his "Rebuttal" (HARDCORE COMPUTIST #3) Allen L. Wyatt asked how you would like it if HARDCORE copies were made available. You really ought to tell him. You see, as I write this letter, I am looking at a xeroxed copy of the issue containing his question. You might also tell him that this letter contains a check for \$20 for a subscription to HARDCORE. You might also tell him that I have never seen a real copy of the magazine and that no amount of advertising could have sold me as well as this one bogus copy. Finally, tell him that I have already been burned once by being stuck with a year's subscription to a computer magazine that was of no earthly use to me, and that never again will I subscribe to a magazine sight unseen.

Ellis R. McDaniels
Williamsville, NY

Disk Protection Unjustified

Keep the faith! Like Locksmith when it first came out, I'm sure that you are facing lots of hostilities (it shows in your pugnacious attitude). But nonetheless, people have the right to be able to do

what they will with the programs that they buy. There is something particularly galling about a package like *DB Master* that, on the outside of the package, lets you know that by merely opening it you have bought it, as well as threatening everything short of murder and mayhem should it ever be found anywhere other than in your own disk drive. Then, on the inside, it repeats the oft-seen disclaimer "No warranty . . . is made with respect to quality, performance, merchantability, or fitness . . . AS-IS . . . entire risk as to performance is with the Customer . . . if defective, Customer assumes entire cost of all necessary servicing, repair, etc., etc." After spending some \$700 on data bases that don't perform like they say, I've gone back to using a public domain program that at least I can modify to suit my own needs. I think most of the software companies will eventually move to end the practice of protection (except perhaps on games) because it is costly as well as counter-productive in a world where Apples are being used more and more for business purposes. Even with games, if the volume was high enough to bring down the price, they wouldn't care about protection any more than Capital Records does (and I've yet to see a piece of software that could possibly have cost as much as mastering a new record by the Stones or such).

It's good to see a publication take a "Hardcore" consumer's point of view. When I first bought my Apple I went to a local users' group meeting. The local group was sponsored by and held its meetings in a room of a Computerland store. The same outfit had just refused to stock a well-known computer mag for running an article on mail-order purchasing. Conflict of interests?

Anyway, cheers to you. A little less stridency in your tone wouldn't hurt, but it is fun to translate into Japanese for the guy that bought the subscription.

Jamie Hubbard
Yokohama, Japan

Boot Code Tracing Not Compatible With RANA Systems

I would like to make a suggestion to the author(s) of such articles as "Boot Code Tracing" and other future articles that use or involve moving binary code out of the disk controller prom. I tried "Boot Code Tracing" with a back-up copy of *Apple Galaxian*, but it refused to work. The reason why is because I don't own an Apple brand drive controller (my system is a RANA Elite One disk drive and a RANA Systems disk drive controller card). It was quite frustrating to learn that the steps of the article

hardcore

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Printing:

Grange Printing, Inc.

Seattle, WA

Publishing:

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P.O. Box 44549

Tacoma, WA 98444

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were not compatible with my system. I sincerely hope that you consider a column on how to utilize the RANA controller card in future articles. I am sure that I am not the only person who owns a RANA outfit and subscribes to **HARDCORE COMPUTING**.

HARDCORE COMPUTING #3 was thoroughly enjoyed. Your publication is the first one from which I have actually learned any information of importance, after reading hundreds of other Apple mags.

Dan Cosper
Danville, PA

Software Dealer Angry at Disk Protection

I am a recent subscriber to **HARDCORE**. I would have been with you sooner but, as much of issue #1 mentions, **CENSORSHIP** of your ads prevented my knowing about it.

You might be interested in knowing there are people who believe exactly as you do regarding copy-protection. I am an Apple dealer as well as Apple user. My own Apple was purchased about 3 years ago, so dealer or not, I consider

myself primarily an Apple user! I know dealers who are all for copy-protection. They are almost as paranoid as the software writers regarding "theft." Maybe it's the clientele we have at Collins Communications—they are mostly business and industrial customers, but these people need another hindrance to the usability of their machines like they need a horseshoe magnet on top of the disk drive! We don't run the game player away if he wants an Apple, but on the other hand, we don't advertise or cater to him either. We've been in the two-way radio, telephone interconnect, CCTV, and industrial electronics sales and service business for nearly 20 years. Our customers trust us to sell them equipment we can service and support. To me support means **SOFTWARE** as well as hardware. We try to use off-the-shelf material when it fits. If nothing is available, we next try to customize a package, and if that fails, we are forced to start from scratch and write him what he needs. Since we don't really enjoy reinventing the wheel, we try hard to use a commercial package. Most of these are locked up tighter than hell. We have been literally forced into copy-protection-breaking. We were not and are not stealing anything from anybody. This software has been bought with only one thought . . . **USING** the damned stuff. When it is impossible to use, modify, and back up as desired by our customers, I have absolutely no qualms about digging into it by any means available. It's gratifying to know **HARDCORE** is, indeed, providing new ideas to help with the digging. Particularly appreciated are your efforts at not only copying this stuff, but remounting on standard DOS so that it can be modified as required. I realize this is very difficult in some packages, but please continue to publish your methods for doing this.

We are just beginning to feel the sting of copy-protection in a way many Apple users will never experience. We are selling more and more hard disk drives. A copy-protected package simply cannot be used on a hard disk drive. The *Cameo HD* system is one of our favorites and at the moment the only file transfer utility available that works great on standard DOS, but it doesn't do a thing with copy-protected disks. *Locksmith*, *Copy II+*, and the others cannot be used for transferring, due to the fact that the *Cameo* requires a volume number which is not enterable with any of the present copy programs (of which I am aware).

There's one other comment I have about Apple information as it applies to

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copy-protection. There is no doubt that every Apple owner owes more to Don Worth and Peter Lechner than probably any other contributors anywhere. Without *Beneath Apple DOS*, I, for one, would be much dumber than I am regarding good old 3.3. Their second package, *Bag of Tricks*, with the disk, adds a great deal more to the average user's understanding of the Apple. My complaint comes in not what they tell us but in what they REFUSE to tell us. Under the guise of ethics, their ZAP program on the *Bag of Tricks* disk only reads what they want it to read. Many programs which can be copied with *Locksmith*, *Copy II+*, and other bit copy programs cannot even be read with their ZAP utility. What gives??? This pair, which has done a great service in providing information, suddenly drops the curtain on something they know but are not willing to let us know. I would really like to think this is not because their *Bag of Tricks* disk is locked. Whatever the reason, though, it still leaves me wondering why they are willing to tell us some, but not all, of the information they have gleaned about the *Apple Disk Operating System*. If this is the basis of a third book named *What We Didn't Tell You Earlier*, then so be it. I just hate to see people with the obvious understanding they have of Apple DOS, plus the ability to communicate it to others, stop short of disclosing the whole story. As I see it, nobody but the copy-protectors could possibly be "hurt" by telling everything the Worth/Lechner team knows.

When I get cranked up on the subject of copy-protection my blood pressure begins to rise. Rather than risk a blow-out, I'll get back to business and let you get back to getting out a fine magazine. Keep up the good work!

Barry W. Collins
Demopolis, AL

Reader Reviews Protection-Free Software

As an end user in the struggle against copy-protected, unlistable software, I would like to encourage **HARDCORE COMPUTIST** to serve as a base from which we can acknowledge particular publishers and software.

May I suggest that **HARDCORE COMPUTIST** begin an "END USERS' SUPPORT" column which will provide readers with a list of software and the publishers who do NOT use copy-protection. This is not to say that we MUST purchase these programs but

when planning a software purchase, I feel that we should give these publishers our attention and consideration first. All readers could contribute to this listing which could then be updated regularly in HC.

I would like to initiate the process with the following entries:

1) **SUPERIOR SOFTWARE**: President Thorne D. Harris has been busy lately writing to all the major computer publications expressing his company's views on the importance of listable, protection-free software.

2) **BEAGLE BROS.**: This company offers excellent support and documentation, and their software is just plain fun to use. The documentation for *DOS Boss*, for example, contains a complete listing of the program.

3) **VIDEX Videoterm and Enhancer II Utilities Disks**: Excellent support, and the documentation contains the program listings. When I purchased the *Enhancer II*, my utilities disk would not boot, nor could it be copied. **VIDEX** sent a replacement disk at no cost to me and, in fact, I did not even have to return the bad disk to them.

4) **PENGUIN SOFTWARE**—Graphics Packages ONLY! Penguin is still copy-protecting their arcade/adventure games. Too bad Mark Pelczarski's "faith" in the end user pertains only to his more expensive software. Of course, games are where the fast money is, too.

5) **AVANT-GARDE CREATIONS**—"GRAPHICS APPLICATIONS SYSTEMS" and "PAINT MASTER SCENE UTILITY" programs ONLY: As far as I know, these are the only two items not protected. I have *Hi-Res Secrets* and it is indeed protected. Check with the publishers themselves on their other products.

Well, that ends my contribution to this new continuing column of yours. I will leave up to you how this information would best be organized and presented to readers of HC. I look forward to your response on this subject in the next issue.

Martin Halpern
Laguna Hills, CA

We encourage our readers to write to us about unprotected programs and/or companies who sell them. While we will publish insightful and concise comments in our letters column, well-written and thorough articles might be accepted as reviews.

Spreading the Word About Hardcore

I know this may sound a little far-fetched, but...

You are experiencing a difficult time in getting the word out about your publication, **HARDCORE**. How about your readers giving you a hand? We can inform co-workers, church members, and whoever else about you by simply using the Good Old Bulletin Boards made available to us for our use. Just tell us what you would like said and we can tack up the "notices" for you, just like wanted posters.

I am employed at Palo Verde Nuclear Generating Station outside of Phoenix, AZ. We have over 8,000 workers here and that's a start.

Just give us the word and a sample and maybe we, the readers, can help you off to the start you deserve.

Gerald R. Rego
Litchfield Park, AZ

Gerald—Thanks for your offer. Subscribers could send us the names and addresses of Apple owners they know, and we'll send a free 32-page flyer, which contains excerpts from past issues and information about our magazines.

Request for Users' Group

I am a teacher of programming and software usage at Patton State Hospital. One of our major difficulties is trying to keep our software intact through a class of 200.

I compliment you on your publication and ask that if anyone would like to form a users' group via mail, we would be willing.

L.B. Cann
Patton, CA

It's a Boy!

At times during the preceding year, I had doubts for your continued success because of the prolonged absence of any publications. However, as it becomes apparent that more and more magazines are now carrying your ads, one may assume that the pregnancy is over and the great day of delivery has arrived. I want to wish you and your staff continued success; your success guarantees me a continued flow of great information.

Rober Margid, M.D.
West Covina, CA

SOFTKEYS

Magic Window II, ARTSCI, Inc.
10432 Burbank Boulevard
North Hollywood, California 91601
(213) 985-2922 \$150.00

Softkey for

Magic Window II _____ by Bobby

Many readers ask for a step-by-step article explaining how to copy a protected disk, an article so easy that even a beginner could understand the process and successfully copy the disk. This article was tested by a person with some programming knowledge but little experience with the Apple. We think anyone could perform this Softkey.

REQUIREMENTS:

- Apple II with 48K
- 1 Disk Drive
- 1 Initialized Blank Disk

Magic Window II is an updated version of the old Magic Window word processor. Many new features have been added, including paragraph gluing and search and replace functions. Unfortunately, a few bugs have also crept into the program, so in an effort to fix these bugs I had to unlock the disk. Although the original program disk can be cataloged and files can be loaded and saved to it, the actual word processor is protected and does not appear on the disk.

I discovered that there are four separate Magic Window programs, stored as consecutive sectors of data. The four versions are:

- 1) 40/80 (columns) without a RAM card
- 2) 40/80 with a RAM card
- 3) 40/70/80 without a RAM card
- 4) 40/70/80 with a RAM card

After examining the file BRUN MW II, I was able to determine which sectors each of the four versions were on.

The boot program (BRUN MW II) first checks to see if a RAM card is present, and then loads the proper version of the program (40/80 or 40/70/80 columns). Writing a BASIC program to duplicate this function was easily done, but I still needed the actual programs from the disk so that the BASIC program could load them.

The easiest way to do this was to use the same program that Magic Window II uses to read in each of the four files (BRUN MW II). What follows is a step-by-step procedure for getting the proper routine into the computer.

The HELLO Program

First you need a blank initialized diskette:

- 1) Boot the DOS 3.3 System Master.
PR#6
- 2) Insert a blank diskette.

- 3) Clear the program in memory.
FP
- 4) Enter the Applesoft HELLO program below.
- 5) Initialize the disk with the program HELLO.
INIT HELLO
- 6) Remove this disk. This will be your new Magic Window diskette.

Now you need to load each of the four versions of Magic Window from the old Magic Window disk and save them onto the new disk. The following shows how to accomplish this feat. (You might want to place a protect tab on the original so you don't accidentally alter the disk.)

Copying the Disk

- 1) Boot the original Magic Window II disk. When the prompt appears (asking which version to load), press reset. This bypasses all of the protection on the disk and leaves the main controller routine intact.

```
10 D$ = CHR$(4)
20 NORMAL : TEXT : HOME
30 PRINT "MAGIC WINDOW II"
40 PRINT : PRINT
50 PRINT "PLEASE SELECT VERSION:"
   "
60 PRINT
70 PRINT "1 - 40/80 COLUMN (MORE
   FREE SPACE)"
80 PRINT
90 PRINT "2 - 40/70/80 COLUMN (L
   ESS FREE SPACE)"
100 PRINT : PRINT
110 PRINT "YOUR SELECTION? " ; : GET
   A$
120 PRINT A$
130 A = VAL (A$) : IF A < 1 OR A >
   2 THEN PRINT CHR$(7) : VTAB
   11 : GOTO 110
140 A$ = "" : GOSUB 180 : CALL 768 :
   IF PEEK (0) THEN A$ = "/WI
   TH RAM"
150 HOME : VTAB 12 : HTAB 10
160 PRINT "LOADING MW II "A;A$
170 PRINT D$"BRUN MW II "A;A$ : END

180 FOR X = 0 TO 29 : READ B : POKE
   768 + X, B : NEXT
190 RETURN
200 DATA 160,0,132,0,173,131,19
   2,173,131,192,152,141,0,208,
   205,0,208,208,7,200,208,244,
   169,1,133,0,173,129,192,96
```




2) Now enter the monitor.

CALL-151

(If an "OUT OF MEMORY" error appears, try again.)

Since there are four versions of the program on disk, each of these must be loaded and saved separately. The following steps show how to accomplish this.

3) Type

18:04 00 3A 0A

80F6G

This information tells the subroutine on which track and sector to start, the number of pages to read, and where to place the data.

After the disk stops spinning, place the blank disk in the drive and save the file (remember to do this from the monitor [*]).

BSAVE MW II 1, ASA00, LS3A00

Return the original Magic Window II disk to the drive.

4) The other three files should be saved in the same manner. Don't forget to put the blank disk back in the drive before saving each file.

18:12 00 5A 0A

80F6G

(Insert back-up disk.)

BSAVE MW II 2, ASA00, LS5A00

(Insert original disk.)

18:08 00 3B 09

80F6G

(Insert back-up disk.)

BSAVE MW II 1/WITH RAM, AS900, LS3B00

(Insert original disk.)

18:0C 00 3B 09

80F6G

(Insert back-up disk.)

BSAVE MW II 2/WITH RAM, AS900, LS3B00

(Insert original disk.)

The file SYS.OPTIONS can now be loaded from the Magic Window disk and placed on the back-up. First, insert the original disk and

BLOAD SYS.OPTIONS

Next, insert the back-up disk.

BSAVE SYS.OPTIONS, ASABD, LSD

The other Magic Window disk can be copied with COPYA from the System Master onto a blank disk.

Modifications to the HELLO Program

The HELLO program allows you to select which version of Magic Window you wish to use. The program first POKes a small machine language routine onto page 3 of memory. This routine checks for a RAM card and sets certain flags depending on whether or not one was found. After this is completed, you will be presented with two choices exactly like those you saw on the Magic Window II disk. The BASIC program operates in a manner similar to the original machine language program that was found on that disk.

Since each of the four files can stand alone, the HELLO program can be bypassed and the correct version of Magic Window can be BRUN directly. A program

allowing you to ignore the first question and immediately skip to the proper version would consist of only one line:

```
10 PRINT CHR$(4)"BRUN version of Magic Window"
```

The following chart will allow you to choose the proper version to run:

	40/80	40/70/80
RAM	MW2 1/WITH RAM	MW2 2/WITH RAM
No RAM	MW2 1	MW2 2

The Technique

The unlocking technique for Magic Window II can be used with some other software on the market. ARTSCI only protected two of the sectors on the Magic Window

Softkey for

Multiplan

*In an act of high-tech espionage, one of our nasty competitors (probably disguised as the janitor) stole the Multiplan IOB listing which was to be included in the last issue of **HARDCORE COMPUTIST**. (Actually, we just plain messed up.) So here is the Multiplan article and listing printed in its entirety—we hope.*

Multiplan is an excellent spreadsheet program by Microsoft. It includes an unusually complete manual with a reference guide, and an auto-help mode from within the program. Multiplan allows one and only one back-up to be made, which I found to be an insufficient guarantee (three is my minimum back-up policy for commercial software).

The program is only protected on tracks zero through four. The protection scheme is to change the end of the address mark on those tracks from DE to CB. To allow the Multiplan DOS to read the unprotected disk, a mod must be done to track 0, sector A, changing byte D from CB to DE. This mod is automatically done by the IOB program.

Copy Multiplan by using the IOB program listed below. The IOB copy of Multiplan can then be duplicated with COPY A, or any number of other copy programs.

*For the convenience of our readers we have listed the controller (lines 1000-1030) with the original IOB listing from **HARDCORE COMPUTING #3** (old series).*

```
10 TEXT : HOME : LOMEM: 16385: GOSUB
63000: GOTO 100
20 HOME : VTAB 12: HTAB 12: PRINT
"TRACK "TK" SECTOR "ST: RETURN
30 HTAB 20 - ( LEN (A$) / 2): PRINT
A$:: RETURN
40 HOME : VTAB 12: GOSUB 30: VTAB
14:A$ = "PRESS ANY KEY TO CO
NTINUE ": GOSUB 30: GET AN$:
RETURN
50 POKE BUF,32: POKE CMD,CD: POKE
TRK,TK: POKE SCT,ST: POKE DR
V,DV: POKE VOL,VL: RETURN
60 READ A1: READ A2: READ A3: READ
D1: READ D2: READ D3
```

II disk. These two sectors contained part of the loader required to load the main Magic Window menu. I simply traced the file BRUN MW II to see what it did and what other sectors it loaded into memory. The four Magic Window files could then be loaded by calling a routine that started on a given track/sector and loaded the proper number of sectors into memory, placing them at a given location. By following the previous set of directions, you told the Magic Window menu where each file was by changing locations 18, 19, 1A and 1B.

18: First track of data

19: First sector of data (always 00)

1A: Number of sectors to load

1B: The high byte of the buffer (low byte is always 00)

Multiplan, Microsoft Corporation,
10700 Northup Way,
Bellevue, Washington 98004
\$275.00

by Bobby

```
70 POKE 47445,A1: POKE 47455,A2:
POKE 47466,A3: POKE 47335,D
1: POKE 47345,D2: POKE 47356
D3: RETURN
80 FOR ST = 0 TO DOS: POKE SCT,S
T: GOSUB 20: CALL IO: POKE B
UF, PEEK (BUF) + 1: NEXT : RETURN
85 FOR S = 0 TO DOS * 2 STEP 2: POKE
SCT,ST: GOSUB 20: CALL IO: POKE
BUF, PEEK (BUF) + 1: NEXT : RETURN
90 POKE 47445,213: POKE 47455,17
0: POKE 47466,150: POKE 4733
5,213: POKE 47345,170: POKE
47356,173: RETURN
100 A$ = "INSERT ORIGINAL DISK IN
DRIVE 1.": GOSUB 40
110 CD = RD:DV = 1: GOSUB 50: CALL
IO
120 VL = PEEK (OVL):DV = 2:CD =
IN: GOSUB 50
130 A$ = "INSERT BLANK DISK IN DR
IVE 2. ": GOSUB 40:VL = 0
1000 FOR TK = 0 TO 34
1005 IF TK < 5 THEN POKE 47505,
203
1010 DV = 1:CD = RD: GOSUB 50: GOSUB
80
1011 IF TK = 0 THEN POKE 8192 +
10 * 256 + 13,222
1015 POKE 47505,222
1020 DV = 2:CD = WR: GOSUB 50: GOSUB
80
1030 NEXT
62990 A$ = "COPY COMPLETED": GOSUB
40: END
63000 FOR X = 768 TO 796: READ A
: POKE X,A: NEXT
63010 DATA 169,3,160,8,32,217,3
,96,1,96,1,0,0,0,25,3,0,32,0
,0,1,0,0,96,1,0,1,239,216
63020 TK = ST = VL = CD = DV
63030 TRK = 780:SCT = 781:CMD = 7
88:RD = 1:WR = 2:SLT = 777:D
RV = 778:BUF = 785:ERR = 789
:VOL = 779:IO = 768:INIT = 4
:OVL = 790
63035 DOS = 15
63040 RETURN
63050 DATA 0
```



PARAMETERS

The following list of **Locksmith 4.1** parameters was donated almost entirely by Dr. Leigh Rowan-Kelly of Australia, who owns Locksmith versions 2.0, 2.1, 3.0, 3.1, 4.0, and 4.1, and probably every other known copy program. Excerpts from Dr. Rowan-Kelly's letter reprinted on this page show the perspective of one foreign consumer in the American-dominated computer industry. Comments from other foreign consumers or software companies are welcome.

Additional parameters were supplied by Jon Choe, of Mankato, Minnesota.

We would like to encourage readers to contribute new parameters to the list. Send them to:

HARDCORE COMPUTIST
Copy Notes
P.O. Box 44549
Tacoma, WA 98444

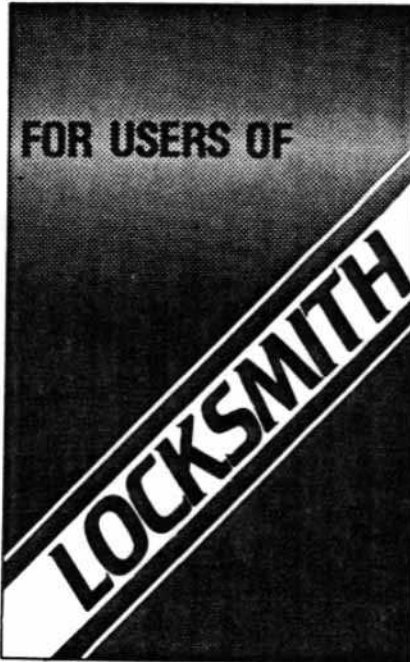
Those who are the first to provide new parameters that are used in print will be acknowledged in this column.

Since parameters are reader-submitted, most have not been tested by the HARDCORE staff. Any corrections to the list would be appreciated.

STAR BLASTER (PDS)

00
S 07-20.5 BY 1.5 72=00 73=00 77=00
78=00 79=12 7C=00 40=20
19=00 44=DF 45=AD 46=DE

HARDCORE COMPUTIST uses an easy-to-read format for its Locksmith parameters list. The example above explains how a program should be copied.



For the game "Star Blaster," these steps should be followed:

- 1) Copy track 00.
- 2) Alter each parameter listed to the new value: change 72 to 00, 73 to 00, 77 to 00, and so on.
- 3) Set the increment to 1.5.
- 4) Use a synchronized copy on tracks 07-20.5.

Symbols Used

- S Use synchronized copy.
... Parameters to be changed before copying the tracks indicated.
BY Indicates the track increment (use 1 if not otherwise indicated).

When following the instructions for a program, complete each step in the order listed. Be sure to change every parameter before copying the track(s) listed to the left of the periods. Once a parameter has been changed, leave it at the new value unless there are later instructions to do otherwise.

For any remaining questions, consult the user's manual for Locksmith.

If a particular program is not listed, try tracks 0-22 normal. Programs that only require this are not listed due to space constraints.

The abbreviated company name can be found in parentheses to the right of the name of the program. Refer to the table of abbreviations for the complete name of the company.

More parameters for Locksmith were published in HARDCORE COMPUTING #3 (old series).

I have become very disenchanted with Omega's attitude of late as they will no longer publish parameter changes for programs — they claim they will only publish parm changes for companies that do not provide a back-up copy or replace a "blown" disk for \$5. I have yet to buy a program that has a back-up included and it is of little value to me in Australia to send a valued program disk off to America for replacement or upgrading — the post delay would be in terms of months rather than weeks! Consequently, I have attempted to copy or "break" every disk that I have bought. So far I have succeeded with all but about 17, and over 400 have been copied For the benefit of your readers I enclose my list of parameter changes for Locksmith 4.1 that work. If one method does not produce a reliable copy then try any other method listed for that program.

Leigh Rowan-Kelly
Gladstone, South Australia

Table of Abbreviations of Publishers

AC Apple Computer	MIS Microsoft	SPC Software Publishing Corp.
AG Avante Garde	ML Micro Lab	SRS Sirius Software
ART ARTSCI	MU Muse	SS Sentient Software
BC Budgetco	PBS Personal Business Systems	STP Softape
BS Broderbund Software	PDS Picadilly Software	STS Strategic Simulations
CC Cavalier Computer	QS Quality Software	SVS Silicon Valley Software
CTS Continental Software	RO Rockroy	SW Stoneware
DM Data Most	SEN Sensible Software	SY Synergistic Software
HN Hayden	SL Sub Logic	UNK Unknown
IC Infocom	SIR Sir-Tech	USA USA
IDSI IDSI	SOL Sierra On-Line	VCP Visicorp
IN Insoft		

Parameters for Locksmith 4.1

Several programs (such as A2-FS1 below) can be copied using one of several methods. In these cases, the different methods are numbered. If one doesn't work, try another.

A2-FS1 (Flight Simulator) -- (SL)

1) 00-21 BY 1.5

07-08 BY 1

9.5

2) 00

1.5-21 BY 1.5....44:DB 45:AB 46:BF

40:20 4E:00 54:12

07-08 BY 1

9.5

A2-PB1 (Night Mission) -- (SL)

00

01-15.....44=DB 45=AB 46=BF 40=20

4E=00 54=12

Write protect before running.

ALIEN RAIN (BS)

S 00-0E BY 1

APPLE LOGO (AC)

00-22

01.....4C=1B 57=00 E9=02 34=FF

50=00 51=00 52=00 53=00

Uses nibble count.

APPLE PFM (UNK)

00-22.....10=04 16=40 46=96 51=00

53=0B 54=12 81=CF 82=F3

83=FC

APPLE III BUSINESS GRAPHICS (AC)

S 00-22 BY 1..18=50 19=00 40=04 46=96

75=00 76=00 77=00 78=00

79=12

APPLE-WRITER II (AC)

00-22.....46=96 54=12

APPLE-WRITER III (AC)

S 00-22 BY 1

AUTOBAHN (SRS)

1) 00

S 04-06 BY 1.....74=00

S 09.5-0C.5 BY 1

2) 00

04-06.....74=00

09.5-0C.5

BAG OF TRICKS (QS)

00

01-14.....40=10 44=D6 53=00

BASIC MAILER (ART)

00-22.....4F=0B

BEER RUN (SRS)

1) S 00.....18=20 19=00 46=96 4D=00

4E=00 52=00 53=00 54=12

57=00 40=20

S 01.5-0D.5 BY 1

2) 00

01.5-0D.5 BY 1...72=00 73=00 77=00

78=00 79=12 7C=00 40=20

19=00 44=DD 45=AD 46=DA

BORG (SRS)

1) S 00.....18=20 19=00 40=20 44=DD

45=AD 46=DA 72=00 73=00

77=00 78=00 79=12 7C=00

S 01.5-0B.5 BY 1

S 0D-20 BY 1

2) 00.....18=20 19=00 40=20 4D=00
 4E=00 4E=00 52=00 53=00
 54=12 57=00 72=00 73=00
 77=00 78=00 79=12 7C=00
 44=DD 45=AD 46=DA

S 01.5-0C.5 BY 1

S 0D-20 BY 1

BPI BUSINESS ACCOUNTING (AC)

1) 00-22.....81=AD 82=FB 83=E6 84=FF
 40=08 16=08 41=FF 19=00
 58=0B 59=FF

2) 00-22.....19=00 21=02 58=19 59=06
 5A=1A 5B=FF BD=44 BE=E6
 BF=45 C0=FF C1=40 C2=01
 C4=44 C5=D5 C6=45 C7=AA
 C8=40 C9=04 CA=00

BRAIN SURGEON (UNK)

1) 00-22
 1B.....4C=1B 57=00 E9=02 D2=00

2) 00-22
 04.....4C=1B 57=00 E9=02 D2=00

BUDGE'S SPACE ALBUM (CP)

00-0B

BUG ATTACK (CC)

00-13 (0E-13 Errors may occur)
 1E.....4C=1B 57=00 E9=02
 Uses nibble count.

CANNONBALL BLITZ (SQL)

00-22.....46=96 54=12 53=00
 03-0F.....4C=1B 57=00 E9=02
 Uses nibble count.

CASTLE WOLFENSTEIN (MU)

1) S 00-22 BY 1.....46=B5 79=12

2) S 00-22 BY 1

COMPUTER AMBUSH (STS)

00
 01-22.....4F=0B

COMPUTER CONFLICT (STS)

00
 01-22.....4F=0B

COMPUTER NAPOLEONICS (STS)

00
 01-22.....4F=0B

CONGLOMERATES COLLIDE (RO)

00-22
 1B.....36=01

CONGO (SS)

00-22.....46=96 4D=00 4E=00 21=02
 26=06 51=00

CONTEXT CONNECTION (CON)

00-22.....19=01 21=02 58=19 59=06
 5A=1A 5B=FF BD=44 BE=EB
 BF=45 C0=FD C1=40 C2=01
 C4=44 C5=D5 C6=45 C7=AA
 C8=40 C9=04 CA=00

CRANSTON MANOR (Hi-Res Adventure #3)

-- (SQL)

1) 00-22
 18.....4C=1B 57=00 E9=02
 Uses nibble count.

2) 00-22
 18.....53=00 44=D5 45=FE 4C=1B
 57=00
 Uses nibble count.

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CYBERSTRIKE (SRS)

1) 00
S 03-0B BY 1
S 11-1C BY 1

2) 00
S 04-0B BY 1.....46=F5 79=12
S 11-1C BY 1.....46=B5

3) 00
S 04-0B BY 1.....46=F5 79=12
11-1C.....46=B5

CYBORG (SS)

00-22.....47=FF 48=F8 4D=00 4E=00
51=00 40=04

DATA REPORTER (SY)

00-22.....4D=00 46=96 54=12

DB MASTER & UTILITIES (SW)

1) 00-05
06.5-22.5 BY 1

2) 00-05
06.5-22.5 BY 1
Write protect before running.

3) For Version 3.2:
00
S 01-05 BY 1
06.5-21.5 BY 1
22.5.....4D=00 46=96 54=12

DEAD LINE (IC)

00-22.....46=96 40=14

DESK TOP PLAN II (VCP)

00-22.....19=01 21=02 58=19 59=06
5A=1A 5B=FF BD=44 BE=EB
BF=45 C0=FD C1=40 C2=01
C4=44 C5=D5 C6=45 C7=AA
C8=40 C9=04 CA=00

DISK LIBRARY (UNK)

00-22.....40=09 53=00 16=77 46=96
47=AA 48=AA 4B=AA 54=12
21=02

DISK RECOVERY (SEN)

1) 00
S 02-16 BY 1

2) 00
S 02-04 BY 1
S 0A-0B BY 1

DRAGON GAMES (UNK)

00-22
04.....4C=1B 57=00 E9=02 D2=00

ELECTRIC DUET (IN)

00-22.....40=08 16=08 41=FF 19=00
81=DE 82=AA 58=0B 59=FF

ESCAPE FROM ARCTURUS (SY)

1) 00-22.....4D=00
2) S 00-22 BY 1.....4D=00

ESCAPE FROM RUNGISTAN (SRS)

S 00-21 BY 1...36=01
Uses nibble count.

EXECUTIVE SECRETARY (PBS)

1) 01.5-21.5 BY 1
00-22 BY 1

2) 00-22.....46=96 54=12

EXPEDITER (SOL)

1) 00-22
03 & IF....4C=1B 57=00 E9=02
Uses nibble count.

2) 00-22
03 & IF....4C=1B 57=00 E9=02 D2=00

FINANCIAL CONTROLLER (UNK)

S 00-22 BY 1

GALACTIC SAGA I (EMPIRE) -- (BS)

S 00-23 BY 1

GALACTIC SAGA II (TRADER) -- (BS)

00-23

GALACTIC SAGA IV (TAWALA'S LAST REDOUBT) -- (BS)

00.....18=50 19=00 40=20 46=96
4D=00 4E=00 52=00 53=00
54=12 57=00
01-22.....44=D5 45=AA 46=B5

GALAXY WARS (BS)

S 00-12 BY 2

GAMMA GOBLINS (SRS)

00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20
S 01.5-0D.5 BY 1....72=00 73=00 77=00
78=00 79=12 7C=00 40=20
19=00 44=DD 45=AD 46=DA

GENETIC DRIFT (BS)
 00.....18=50 19=00 40=20 46=96
 4D=00 4E=00 52=00 53=00
 54=12 57=00
 01-03 BY 1....44=BB 45=B5 46=BB
 04.5-06 BY 1.5
 07.5-08.5 BY 1
 0D.....44=D4 45=D5 46=BB
 0E.5-12.5 BY 1.....44=AD 45=B5 46=DE

GOBBLER (SOL)
 00-22.....4E=00
 03.....4C=1B D2=00 45=DB 4E=01
 34=FF 54=12 52=00

GOLD RUSH (SS)
 00-22.....46=96 4D=00 4E=00 21=02
 26=06 51=00

GOLDEN MOUNTAIN (BS)
 00
 S 01-0D BY 2
 02-0E BY 2

GORGON (SRS)
 1) 00.....54=12
 S 01.5-0E.5 BY 1.....54=09
 2) 00.....18=20 19=00 46=96 4D=00
 4E=00 52=00 53=00 54=12
 57=00 40=20
 S 01.5-0E.5 BY 1.....72=00 73=00
 77=00 78=00 79=12 7C=00
 40=20 19=00 44=DD 45=AD
 46=DA

HADRON (SRS)
 1) S 00.....18=20 19=00 46=96 4D=00
 4E=00 52=00 53=00 54=12
 57=00 40=20
 S 01.5-0D.5 BY 1
 2) 00.....18=20 19=00 46=96 4D=00
 4E=00 52=00 53=00 54=12
 57=00 40=20
 S 01.5-0E.5 BY 1.....72=00 73=00
 77=00 78=00 79=12 7C=00
 40=20 19=00 44=DD 45=AD
 46=DA

HAYDEN ALIBI (HN)
 00-02
 03-22.....51=00 52=00 53=00 54=12
 19=00 18=50 57=00 44=D4
 46=B5
 1B.....4C=1B E9=02
 Uses nibble count.

HAYDEN APPLESOFT COMPILER (HN)
 S 00-22 BY 1..46=96 71=19 79=12
 Errors on 10-1E O.K.
 Very sensitive to drive speed.

HI-RES SECRETS (AG)
 00-22.....46=96 54=12 34=FB

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HIRES SOCCER (SOL)
S 00-22 BY 1

HYPER HEAD ON (DEMON DERBY) -- (BS)
S 00-12 BY 2

IMAGE PRINTER (SEN)
S 00-07 BY 1
S 09-22 BY 1

08.....4C=1B 57=00 E9=02 D2=00
44=FE 45=AB 54=12 50=00
51=00 52=00 53=00

JAWBREAKER (SOL)

1) 00-22
03.....4C=1B 57=00 E9=01
Uses nibble count.

2) 00-22
03.....34=FF 44=DF 45=EF 46=F7
50=00 51=00 52=00 53=00
54=12

MAD VENTURE (ML)
S 00-23 BY 1

MAGIC SPELLER (ART)
00-22.....4F=0B

MAGIC WORD (ART)
00-22.....4F=0B

MASTER DIAGNOSTICS PLUS (UNK)
00-22
04.....4C=1B 57=00 E9=02 D2=00

MASTERTYPE (LNS)
1) 00-02
03-1A.....44=D4 54=12
1C-22
2) 00-02
03-1A.....44=D4
1C-22

MILLIKEN MATH (ML)
00-22.....4C=18 46=B5 54=12 50=00
51=00 52=00 53=00

MISSION ASTEROID (SOL)
S 00-22 BY 1

MOUSKATTACK (SOL)
00-22.....46=96 54=12 53=00
23.....4C=1B 57=00 E9=02
Uses nibble count.

MONTY PLAYS MONOPOLY (IC)
00-05.....1E=0B

MULTI DISK CATALOG III (SEN)
1) S 00-02 BY 1
S 04-09 BY 1
2) S 00-22 BY 1

MYSTERY HOUSE (Hi-Res Adventure #1)
-- (SOL)
1) S 00-22 BY 1
2) 00-10
12-22

WANTED

Alive and Running

PROGRAMS

Hardcore Computist needs programs, Softkeys, articles, A.P.T.'s, and reviews.

Preferred topics for articles include boot code tracing, adventure tips and other game tips, and methods of unlocking copy-protected disks. Innovative and interesting programs of any type are also encouraged.

Writers and programmers should send a stamped, self-addressed envelope for our Writer's Guide before sending manuscripts or software. Address to Hardcore Writer's Guide, P.O. Box 44549, Tacoma, WA 98444.

NIGHTMARE GALLERY (SY)
00-22.....46=96 54=12 51=00 4D=00
4E=00

2) 00-22.....10=04 16=40 46=96 51=00
53=0B 54=12 81=CF 82=F3
83=FC

OLYMPIC DECATHLON (MIS)

1) 00-22

PHOTAR (STP)

S 00-22 BY 1

2) S 00-22 BY 1.....46=B5 A8=00 71=18
79=12

POOL 1.5 (IDSI)

1) S 00-15 BY 1

S 1E-21 BY 1

00-TOPOS (SS)

1) 00-22.....32=88 01=06

2) S 00-15 BY 1.....46=B5 79=12

2) 00-22.....21=02

S 1E-21 BY 1

3) 00-22.....4D=00 4E=00 21=02 2C=06
48=EE 49=FF

PRESIDENT ELECT (STS)

1) 00-22.....25=19 65=00 6B=00

OPERATION APOCALYPSE (STS)

00-22.....25=19 65=00 6B=00

2) 00-22.....25=19 6B=00

OUTPOST (SRS)

1) 00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20

PUCKMAN (UNK)

00.....54=12

01-0D.....54=09

S 01.5-0D.5 BY 1.....72=00 73=00
77=00 78=00 79=12 7C=00
40=20 19=00 44=DD 45=AD
46=DA

PULSAR II (SRS)

S 00

S 1C.5-1D.5 BY 1

S 02-0C BY 1..44=DD

S 13-19 BY 1

S 1A.5-1B.5 BY 1

2) 00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20

QUICK LOADER (SEN)

00

S 02-11 BY 1

S 01.5-09.5 BY 1.....72=00 73=00
77=00 78=00 79=12 7C=00
40=20 19=00 44=DD 45=AD
46=DA

RASTER BLASTER (BC)

1) 00.....44=AD 45=DE

PADDLE GRAPHICS (SOL)

00-22

23.....36=01

Uses nibble count.

S 05-11 BY 4

S 06-12 BY 4

S 07.5-0F.5 BY 4

S 01.5-03.5 BY 2

PEGASUS II (SOL)

1) 00-22

03.....4C=1B 57=00 E9=02

Uses nibble count.

2) 00-22.....4E=00

03.....4C=1B 57=00 E9=02

Uses nibble count.

2) 00.....46=96 54=12

S 05-11 BY 4.....44=AD 45=DE 46=00

72=00 73=00 75=00 78=00

79=12

S 06-12 BY 4

S 07.5-0F.5 BY 4

S 01.5-03.5 BY 2

PFS (SPC)

1) 01-13

00.....40=08 41=FF 16=08 19=00

58=0B 59=FF 54=12 12=02

44=93 45=F3 46=FC 47=FF

81=93 82=F3 83=FC 84=FF

(00 error may occur)

Write-protect disk before running.

RETROBALL (SOL)

00

04-06

09-0C

0E-10

12-14

17-1D

20-22.....4D=00 4E=00

RINGS OF SATURN (SL)

S 00-02 BY 1
03-22
S 05
S 09

STAR THIEF (CC)

1) 00-0E Error may occur on 0E.
22.....4C=1B 57=00 E9=02
Uses nibble count.

2) 00-13

Errors may occur on 0E-13.
22.....4C=1B 57=00 E9=02
Uses nibble count.

SARGON II (HN)

1) 00-1A.....19=00 54=12 47=FF 4C=18
48=FF 50=00 51=00 52=00
53=00

THIEF (DM)

00-22.....83=FF 4F=0B 53=00
S 04-05 BY 1..38=02 1E=02 19=00 12=01
7C=00

2) 00-1A.....19=00 54=12

SCREENWRITER II (SOL)

00-22.....4D=00

THRESHOLD (SOL)

1) 00-22
01-23 BY 22
22.....4C=1B 57=00 E9=02
Uses nibble count.

SHATTERED ALLIANCE (STS)

1) 00.....25=19 65=00
01-22.....4F=0B

2) 00-22

01.....4C=1B 57=00 E9=02
Uses nibble count.

2) 00-22.....25=19

3) 00.....4C=18 47=FF 53=0B 54=12
01-22.....44=D4 46=B5

TIGERS IN THE SNOW (STS)

1) 00-22.....25=19 65=00 6B=00

4) 00-22.....25=19

2) 00-22.....25=19 6B=00

SNAKEBYTE (SRS)

00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20

TIME ZONE (Hi-Res Adventure #5) -- (SOL)

1) S 00-04 BY 1
05-22 (Disk sides 1B to 6L,
tracks 00-22.)

S 01.5-0A.5 BY 1....72=00 73=00 77=00
78=00 79=12 7C=00 40=20
19=00 44=DD 45=AD 46=DA

2) 00-22 Uses extended retry. (Disk
sides 1B to 6L, tracks 00-22.)

SNEAKERS (SRS)

00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20

TWERPS (SRS)

1) 00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20

S 01.5-0C.5 BY 1....72=00 73=00 77=00
78=00 79=12 7C=00 40=20
19=00 44=DD 45=AD 46=DA

S 01.5-0E.5 BY 1.....72=00 73=00
77=00 78=00 79=12 7C=00
40=20 19=00 44=DD 45=AD
46=DA

SNOGGLE (PUCKMAN) -- (BS)

1) 00-09

1C.....4C=1B 57=00 E9=02 D2=00

2) 00-0F

S 10.5-11.5 BY 1

2) 00.....18=20 19=00 46=96 4D=00
4E=00 52=00 53=00 54=12
57=00 40=20

3) S 00-09 BY 1

STAR BLASTER (PDS)

00
S 07-20.5 BY 1.5....72=00 73=00 77=00
78=00 79=12 7C=00 40=20
19=00 44=DF 45=AD 46=DE

S 01.5-0E.5 BY 1.....72=00 73=00
77=00 78=00 79=12 7C=00
44=DD 45=AD 46=DA

S 1C

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3) 00.....18=20 19=00 46=96 4D=00
 4E=00 52=00 53=00 54=12
 57=00 40=20
 S 01.5-0E.5 BY 1.....72=00 73=00
 77=00 78=00 79=12 7C=00
 40=20 19=00 44=DD 45=AD
 46=DA
 1A.....4C=1B 57=00 E9=02
 Uses nibble count.

U-BOAT COMMAND (SY)

1) 00-22.....4E=00 51=00 52=00 40=02
 1E=30 1B=19 1D=18 44=00
 45=00 46=EB 47=AF
 2) 00-22.....4E=00 51=00 52=00 40=02
 1E=30 1B=19 1D=18 44=00
 45=00 46=EB 47=AF 48=FB
 49=EB

VISICALC (VCP)

1) 00-22 Ignore 01 error.
 2) 00-15 Ignore 01 error.

VISIDEX (VCP)

1) 00-22.....40=04 16=08 41=FF 19=00
 58=0B 59=FF 81=AA 82=EB
 83=FD 21=02
 2) 00-22.....40=04 16=08 41=FF 19=00
 58=0B 59=FF 81=AA 82=EB
 83=FD 21=02 46=96 54=12

VISIFILE (VCP)

1) 00-22.....19=01 21=02 58=19 59=06
 5A=1A 5B=FF BD=44 BE=EB
 BF=45 C0=EC C1=40 C2=01
 C4=44 C5=D5 C6=45 C7=AA
 C8=40 C9=04 CA=00
 2) 00-22.....19=00 21=02 58=19 59=06
 5A=1A 5B=FF BD=44 BE=EB
 BF=45 C0=EC C1=40 C2=01
 C4=44 C5=D5 C6=45 C7=AA
 C8=40 C9=04 CA=00

VISISCHEDULE (VCP)

00-22.....40=04 16=08 41=FF 19=00
 58=0B 59=FF 81=AA 82=EB
 83=EC 21=02 46=96 54=12

WIZARD AND THE PRINCESS (Hi-Res Adventure #2) -- (SOL)

S 00-22 BY 1

WIZARDRY #1 (Proving Ground) -- (SIR)

1) 00-09
 0F-22
 S 0A-0E BY 1.....36=01
 Uses nibble count.
 Write protect before running.

2) 00.....36=01 21=02 46=96
 S 01-22 BY 1.....36=00
 Uses nibble count.
 Write protect before running.

WIZARDRY #2 (Knight of Diamonds) -- (SIR)

S 00-09 BY 1
 S 0F-22 BY 1
 S 0A-0E BY 1..36=01
 Uses nibble count.
 Write protect before running.

WORD HANDLER (SVS)

00.....46=96 54=12
 11-22
 01-0C.....44=FF 45=DF 46=DE
 Type 8 errors O.K.

WORD HANDLER II (SVS)


00.....46=96 54=12 53=00
 11-22
 01-0C.....44=FF 45=DF 46=DE
 If type 8 error happens recopy track until good.

Adventure Tips

Cranston Manor and Mystery House,
 Sierra On-Line, Inc., 36575 Mudge
 Ranch Road, Coarsegold, California
 93614

Cranston Manor:
 1) Turn the lights out on the pink bull.
 2) In lift rooms, drop something and then lift it to get to upper levels.

Mystery House:
 After looking through the telescope, go DOWN twice, NORTH four times, and then UP to get into the kitchen.



These Adventure Tips
 courtesy of:
 Tim Lewis
 Morgan Hill, California

Page Flipper

by Robb Canfield



To display part of the text page and part of the hi-res page simultaneously, one would normally use the mix-screen softswitch. However, to vary the display so that one could view the top half of the text page and the bottom half of the hi-res page, special cards or a different computer would be necessary.

Page Flipper is a program which attempts to resolve this dilemma in a more reasonable fashion. The result is an interesting scrolling technique which simultaneously displays both pages. Additionally, one can vary the direction or the speed of the "scroll." When the user quickens the scrolling effect enough, both pages flip so rapidly that the pages seem to merge into one flickering image.

The program is easy to enter and

use. Simply type in the hex dump in illustration 1. Then load in a hi-res picture and put some text on the text page. Finally, CALL 768—and watch. To exit the program simply use the ESC key.

Press any key to alter the speed of the scrolling. The R and S keys scroll slowly in opposite directions. Keys with ASCII values lower than that of R (A, for example), scroll

upward more quickly; keys with higher values (X or Z) scroll downward more rapidly. A ctrl @ produces the fastest flickering image.

The challenge for the hardcore programmer is to write a subroutine to freeze the scrolling effect while the program is running. If you find an efficient and innovative solution, send it to SoftKey Publishing. We'll publish the best response.

Page Flipper

```

1000 *-----
1010 * PAGE FLIPPER, BY ROBB CANFIELD
1020 *
1030 *   COPYRIGHT 1983 BY SOFTKEY
1040 *-----
1050
1060
1070 TEXT.PAGE .EQ $C051
1080 PAGE.1 .EQ $C054
1090 HIRES .EQ $C057
1100 FULL.SCREEN .EQ $C052
1110 HIRES.PAGE .EQ $C050
1120 ESC .EQ $9B   THE ESCAPE KEY
1130 KBD .EQ $C000  GET A KEYPRESS
1140 CLEAR.KEY .EQ $C010
1150
1160
1170
1180 .OR $300
1190 .TF FLIP.0
1200
1210
1220 FLIP
1230   STA PAGE.1   GET ON PAGE 1
1240   STA FULL.SCREEN SET FULL SCREEN
1250   STA TEXT.PAGE SET UP TEXT PAGE
1260   STA HIRES   SHOW THE HIRES SCREEN
1270
1280 LOOP
1290   LDA KBD     GET A KEYPRESS
1300   CMP #ESC   IS IT THE ESCAPE KEY
1310   BEQ END.2

```

```

1320   JSR DELAY
1330   STA HIRES.PAGE START ON THE TEXT SCREEN
1340   BEQ .3     USE FOR TO EVEN OUT TIMING
1350 .3   NOP
1360   NOP
1370   NOP
1380   NOP
1390   NOP
1400   JSR DELAY
1410   STA TEXT.PAGE SHOW THE HIRES PAGE
1420   JMP LOOP
1430
1440 END   RTS     RETURN TO CALLER
1450
1460 DELAY
1470   LDX #509
1480 .1   DEX
1490   BEQ END   RETURN TO CALLER
1500   TAY
1510 .2   DEY
1520   BNE .2
1530   BEQ .1
1540
1550
1560
1570 END.2
1580   STA CLEAR.KEY
1590   RTS

```

Illustration 1

Hex Dump and Checksums BEG: 300
END: 34B

```

0300- 80 54 C0 8D 52 C0 8D 51 : $8F53
0308- C0 8D 57 C0 A0 00 C0 C9 : $F875
0310- 9B F0 22 20 2A 03 8D 50 : $D414
0318- C0 F0 00 EA EA EA EA EA : $ACCB
0320- 20 2A 03 8D 51 C0 4C 0C : $E450
0328- 03 60 A2 09 CA F0 FA A0 : $A971
0330- 88 D0 FD F0 F7 8D 10 C0 : $C389
0338- 60 03 C9 B0 D0 0A 20 40 : $9C1A
0340- 03 A9 88 20 48 03 A9 AF : $A85C
0348- 20 02 C1 60 : $B218

```



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#15 The Heroes' Castle

#16 The Caves of Mondamen

#17 Merlin's Castle

#18 Hogarth Castle

#19 Death Trap

#20 The Black Death

#21 The Quest for Marron

#22 The Senator's Chambers

#23 The Temple of Nguret

#24 Black Mountain

#25 Nuclear Nightmare

#26 Assault on the Mole Man

#27 Revenge of the Mole Man

#28 The Tower of London

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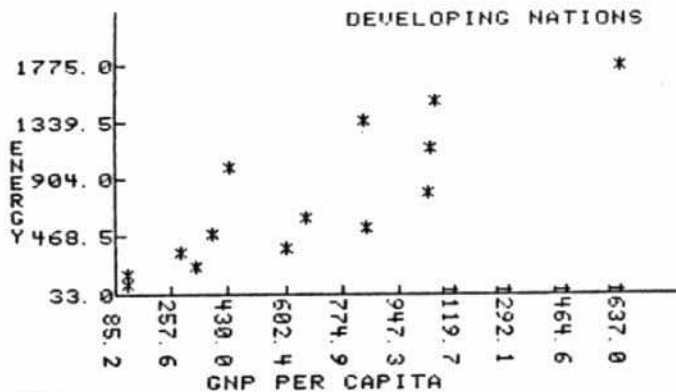
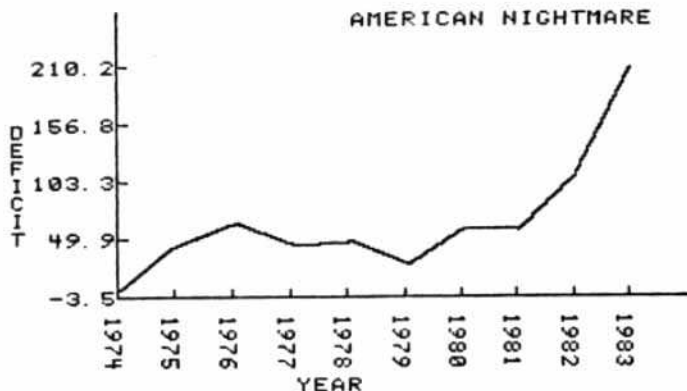
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String Plotter

by Rich Hofmann



Making Quality Graphs Easily

To make the two graphs pictured here, see pages 23-24.

The Problem

When using a two-dimensional plotting program on the Apple hi-res screens, the real interface problem is two-fold. First, a procedure must be developed that: a) scales the axes of the program graph into the system of Apple screen coordinates, and b) limits the dimensions of the graph to the data to be plotted. Second, some method for labeling the plot and its parts must be found. **String Plotter** demonstrates a way of solving these problems, and also provides the user with a professional-quality plotting program.

This article will often refer to Apple screen coordinates. Apple uses a 192 by 280 unit Cartesian coordinate system implied by Applesoft. When plotting directly from Applesoft onto a full hi-res screen, it is assumed that the X-axis is 280 units long and the Y-axis is 192 units long. The problem of developing a general plotting algorithm is one of developing a scaling algorithm which will take the actual values to be plotted and convert them to this system of Apple screen coordinates for plotting purposes.

Once the process of converting values to Apple

screen coordinates is understood, the procedure for labeling the plot and its parts is relatively straightforward. Virtually all labeling is done using an ASCII shape table that is a modified form of the one supplied with Synergistic Software's shape package, *Higher Graphics* (see ASCII SET). The shape number for any ASCII character is determined by subtracting 30 from the decimal code for the character. For example, the letter A has a shape number of 35, which is (ASC("A")-30). Because it has been assumed that there will always be an ordinate label (Y-axis), an abscissa label (X-axis), and a general label, as well as numerical labels for the divisions of the axes, the actual coordinate space available for the plotting is less than 192 by 280.

The plotting algorithm determines the Apple hi-res screen coordinates for placement of various shapes: axis divisions, axis division labels, axis titles, and the actual coordinates of the points to be plotted. These Apple screen coordinates will vary as a function of the information input to the algorithm by the user.

Major Program Routines

The string plotter routine has two major parts: the plotting/scaling subroutines and the interactive user-input routine. Data usually have unique properties that impede use of exactly the same plotting procedure for every data set. The String Plotter routine has been developed so that the user may modify different plotting

Rich Hofmann is a professor at the Educational Psychology Department at Miami University in Ohio. He works on an Apple II+ in his spare time, concentrating on graphics, synthetic speech, and program development for young children.

parameters to plot and replot the data, an attempt to make the plot of a given data set more meaningful.

The skeleton of the program will be described in two parts. First the various data entry procedures and user input parameters will be noted. Then the actual plotting algorithm will be discussed.

Data Entry

The data to be plotted may be entered either by keyboard or by sequential text file. For purposes of the DIM statement, it is necessary to enter the number of paired observations to be plotted. Since I frequently have difficulty remembering the number of observations in a data set, I have written the algorithm so the user can enter an overestimate of the number of observations. When entering a second overlay data set, the number entered for the first data set remains as the overestimate.

Titles and Labels

This routine allows the user to enter or reenter the ordinate, abscissa, and total plot titles. All titles are restricted to a maximum of 20 ASCII characters. Notice that pressing return enters the default labels Y-Axis, X-Axis, and String Plotter (lines 1160, 1180 and 1200).

Fundamental Plot Parameters

This subroutine allows the user to enter or reenter the plot parameters that are under direct user control. There are two major parameters: number of axis divisions and on which axis the data is to be sorted. The user can either enter the number of divisions for an axis or press return to allow the algorithm to use the default value arbitrarily set to seven.

The ideal number of divisions for most data sets, as described under grouped data in most basic statistics books, will be between five and fifteen. Therefore, the user is restricted to no more than fifteen and no fewer than two axis divisions when entering the number of divisions.

To plot points connected to form a line plot, sort either the X-variable or the Y-variable. The line plot will differ drastically in each case. It is important to realize that when dealing with paired variables only one of the two variables can ever be considered as being sorted at any time.

Determine Plot Type

This subroutine allows the user to select either a point plot or a line plot. A point plot is a plot of the points as they are defined by the paired coordinate data. A line plot is a plot of the points connected by lines in the order in which they were plotted.

Read a Sequential Text File

This algorithm obtains the data file name from the user, assures the file is available before reading it, and provides an opportunity for the user to make adjustments if the file is not available.

continued on page 26

String Plotter

```

10 IF PEEK (104) < > 64 THEN POKE
    104,64: POKE 103,1: POKE 163
    84,0: PRINT CHR$(4);"RUN S
    TRING PLOTTER"
20 GOTO 2260
30 REM
    INITIALIZING THE PLOT

40 HGR
50 HCOLOR= 3
60 ROT= 0
70 SCALE= 1
80 POKE - 16302,0
90 SLASH = 15
100 DP = 1
110 S = 10
120 TF = 5
130 Y = (234 / XD)
140 Z = 43
150 W = 144
160 VV = 144 / YD
170 HPLOT Z,0 TO Z,W TO 279,W
180 REM
    SLASH AND SCALE ORDINATE
190 C = ((YHIGH - YLOW)) / (YD -
    1)
200 CC = YHIGH - (YD - 1) * C
210 XY = YD - 1
220 YK = (W + 3) - VV * (YD - 1)
230 YSCALE = (W + 3 - YK) / (YHIGH
    - YLOW)
240 FOR I = 0 TO XY
250 X = CC + I * C
260 Q = ABS (X)
270 Q$ = " " + CHR$( (X <
    0) * 45 + (X > = 0) * 32)
280 Q$ = Q$ + STR$( INT (Q + (Q
    < 0) * 1 + (Q > = 0) * .00
    5))
290 Q$ = Q$ + ". "
300 Q2$ = STR$( INT ((Q + (10 ^
    DP)) * (10 ^ DP) + .5))
310 Q2$ = RIGHT$( Q2$,DP)
320 Q$ = RIGHT$( (Q$ + Q2$),S)
330 JJ = LEN (Q$)
340 FOR KK = JJ TO TF STEP - 1
350 XC = 9 + (KK - 6) * 7
360 YC = W + 3 - (I * VV)
370 DRAW (( ASC ( MID$( Q$,KK,1)
    )) - 30) AT XC,YC
380 NEXT KK
390 XC = Z
400 YC = W + 3 - I * VV
410 DRAW SLASH AT XC,YC
420 NEXT I
430 REM
    SLASH AND SCALE ABSCISSA
440 C = ((XHIGH - XLOW)) / (XD -
    1)
450 CC = XHIGH - (XD - 1) * C
460 XY = XD - 1
470 XK = Z - 2
480 XSCALE = ((XD - 1) * Y) / (XHI
    GH - XLOW)
490 FOR I = 0 TO XY
500 X = CC + I * C
510 Q = ABS (X)

```

```

520 Q$ = " " + CHR$ ((X <
    0) * 45 + (X > = 0) * 32)
530 Q$ = Q$ + STR$ ( INT (Q + (Q
    < 0) * 1 + (Q > = 0) * .05
    ))
540 Q$ = Q$ + "."
550 Q2$ = STR$ ( INT ((Q + (10 ^
    DP)) * (10 ^ DP) + .5))
560 Q2$ = RIGHT$ (Q2$,DP)
570 Q$ = RIGHT$ ((Q$ + Q2$),S)
580 JJ = LEN (Q$)
590 FOR KK = JJ TO TF STEP - 1
600 XC = I * Y + Z - 5
610 YC = W - 4 + 7 * (KK - 5)

```

```

620 ROT= 16
630 DRAW (( ASC ( MID$ (Q$,KK,1)
    )) - 30) AT XC,YC
640 NEXT KK
650 XC = (XD - 1 - I) * Y + Z + 3
660 YC = W
670 ROT= 48
680 DRAW SLASH AT XC,YC
690 NEXT I
700 REM
        PLACE LABELS ON ORDINATE
        & ABSCISSA AND TOTAL PLOT
710 ROT= 0

```

A Step-by-Step Guide

How to Use "String Plotter" to Make a Variety of Graphs

by David C. Smith

Rich Hofmann's *String Plotter* program can be used for quick visual display by a researcher examining links between television and violence, an economist correlating inflation with gas prices, a businessman showing the annual profit increases for his company, or a student preparing a term paper on world hunger. In all cases, the procedure for using the program is the same even though the specifications for one graph will differ from those of another.

A step-by-step guide for using String Plotter should eradicate any confusion which would discourage a beginning user. First will be an example which displays a straightforward use of the program. Then, a second example will use a simple modification so that year-by-year graphs (of great use to businessmen and economists) can be easily made.

Entering String Plotter

- 1) Reset Applesoft to its original location.
FP
- 2) Type in the BASIC program, STRING PLOTTER, and save it.
SAVE STRING PLOTTER
- 3) Enter the monitor [CALL-151] and type in the ASCII SET.
4) Return to BASIC [3D0G] and save the set.
BSAVE ASCII SET,ASD00,LS458

Constructing a Simple Graph on a Complex Subject

The first example will be the construction of a graph which shows the relationship between wealth and energy consumption in Third World nations. Although the subject may be intimidating to many, a graph would be a great aid to understanding a text on the subject. At any rate, one need not understand global economics to follow along.

1) When the program is run, the user is asked how the data will be entered. In this example, the keyboard (option #1) will suffice. The alternative, a sequential text file, may prove more desirable for longer lists of data.

Next the program demands an overestimate of the number of cases. Enter "15."

2) The program now asks for the titles for the X and Y axes. Since one of the variables for this graph is the energy consumption per capita in 1974 (i.e., per person), call the Y-axis:

ENERGY

The other variable is the gross national product per capita in 1974 (i.e., how much each person produces, in U.S. dollars). Call the X-axis:

GNP PER CAPITA

The user is also asked to title the graph. Since all the figures deal with Second and Third World nations, call the graph:

DEVELOPING NATIONS

3) The program needs certain information in order to sort the data properly. Since the figure will be a point graph, it makes no difference on which axis the data are sorted. However, if the figure is later changed to a line graph, sorting the data according to GNP per capita would be more instructive. Answer "Y" to the X-axis sort option.

4) Next the program asks how many divisions should be made on each axis. In this case, it makes little difference. Input "10" and "5" (arbitrarily chosen) for the X-axis and Y-axis divisions, respectively.

5) The program allows two options for the type of graph: line or point. Enter "1" for a point graph.

6) Now enter the data. Below is the necessary information. The countries are provided for the user's information and are not used in the actual construction of the graph.

```

720 SPACE$ = " " (30 spaces)
730 LX = INT ((20 - LEN (XTITLE
    $)) / 2)
740 X$ = LEFT$ (SPACE$,LX) + XTI
    TLE$
750 LX = LEN (X$)
760 FOR K = 1 TO LX
770 XC = 43 + I + 7 * K
780 YC = 191
790 DRAW (( ASC ( MID$ (X$,K,1)
    ) - 30) AT XC, YC
800 NEXT K

```

```

810 LX = INT ((20 - LEN (YTITL
    E$)) / 2)
820 X$ = LEFT$ (SPACE$,LX) + YTI
    TLE$
830 LX = LEN (X$)
840 FOR K = 1 TO LX
850 XC = 0:YC = 9 * K
860 DRAW (( ASC ( MID$ (X$,K,1)
    ) - 30) AT XC, YC
870 NEXT K
880 LX = INT ((20 - LEN (TITL
    E$)) / 2)
890 X$ = LEFT$ (SPACE$,LX) + TIT
    LE$

```

Country	X = GNP ¹	Y = Energy ²
1) Argentina	1637	1775
2) Brazil	850	525
3) Chile	1049	1150
4) Dominican R.	608	375
5) Egypt	286	350
6) India	129	175
7) Jamaica	1065	1500
8) Korea	433	1000
9) Mexico	843	1350
10) Morocco	330	240
11) Panama	1038	800
12) Peru	665	600
13) Zaire	123	100
14) Zambia	382	475

For case #15, enter "END".

7) If there is a need to review the data to insure it has been correctly entered, the program now allows that option. If not, the graph will be displayed.

The resulting figure indicates that nations in which individuals produce more tend to use more energy per person as well. This seems to be obvious; however, the graph depicts some exceptions to this tendency, exceptions which could result from differences in culture, lack of natural resources, or other factors.

When the return key is pressed while the graph is displayed, the user is given 12 options:

- 1 SAVE THE PLOT TO DISK
- 2 MODIFY TYPE OF PLOT
- 3 REVIEW/MODIFY DATA
- 4 ALTER AXIS DIVISIONS
- 5 SORT/RESORT THE DATA
- 6 CHANGE THE PLOT SHAPE
- 7 ALTER THE NUMBER OF POINTS
- 8 SHOW THE SAME PLOT AGAIN
- 9 REPLOT THE DATA
- 10 MODIFY TITLES
- 11 ENTER OVERLAY DATA
- 12 QUIT

If options #2, 3, 4, 5, 6, 7, or 10 are chosen, the data must be replotted (option #9) for the graph to change.

¹Mahbub ul Haq, *The Poverty Curtain* (Columbia University Press, 1976), pages 224-226.

²Dennis Pirages, *Global Economics* (Duxbury Press, 1978), page 121. All figures are approximations.

For example, to change the figure from a point graph to a line graph, choose option #2 (MODIFY TYPE OF PLOT). Then enter "2" for a line graph. Finally, choose option #9 to replot the data. For more information on each of these routines, see the accompanying article.

Customizing String Plotter to Make Year-to-Year Graphs

Since String Plotter labels both axes with decimal numerals, the user must modify the program in order to construct a graph which displays annual statistics. Two parts of the program must be changed. First, the labels must be changed to display whole numbers. Second, the user should eliminate part of the program which, for appearance purposes, makes the minimum X-axis value less than the lowest actual data value.

To accomplish the first task, one need only delete lines 540, 550, 560, and change the following line:

570 QS = RIGHTS(QS,S)

Deleting line 2230 will take care of the second problem.

An Example

The program is ready to construct a year-to-year graph. For an example, enter the following responses to see how String Plotter would plot the American budget deficits for the last ten years³.

- 1) KEYBOARD entry.
10 cases.
- 2) X-axis title: YEAR
Y-axis title: DEFICIT
Graph title: AMERICAN NIGHTMARE
- 3) Data sorted on X-axis.
- 4) 10 divisions on X-axis.
5 divisions on y-axis.
- 5) Line graph.
- 6) 1974, 4.7 1979, 27.7
1975, 45.2 1980, 59.6
1976, 66.4 1981, 57.9
1977, 44.9 1982, 110.6
1978, 48.8 1983, 210.2

³U.S. News and World Report, November 8, 1982, page 15; May 9, 1983, page 13.

continued from page 23

When the data are to be entered by sequential text file, it is assumed that the entries are in a paired form, first the X-coordinate and then the Y-coordinate. If one wants to use some error trapping when data are being entered as a text file, it is best to do the text file reading in the main program without FOR NEXT statements.

The ONERR GOTO associated with line 2670 is an error trap for an end-of-file which will be encountered if the disk operating system attempts to read more cases than there are in the file. This error will always occur if the number of paired observations has been overestimated. It does not create a problem in the String Plotter algorithm, as the algorithm simply adjusts the initial count of paired observations to accurately reflect the number of paired observations entered, and then CLOSEs the text file.

Keyboard Data Entry

There is a variety of algorithms available for this procedure. The algorithm used in String Plotter is not sophisticated; it simply allows the user to get the data into the Apple.

```
900 LX = LEN (X$)
910 FOR K = 1 TO LX
920 XC = 115 + I + 7 * K:YC = 7
930 DRAW (( ASC ( MID$ (X$,K,1))
) - 30) AT XC,YC
940 NEXT K
950 RETURN
960 REM
      DRAW POINTS
970 FOR I = 1 TO N
980 XC = XK + (PX(I) - XLOW) * XS
  CLE
990 YC = (YHIGH - PY(I)) * YSCLE +
  YK
1000 DRAW SHAPE AT XC,YC
1010 NEXT I
1020 RETURN
1030 REM
      CONNECT THE POINTS
1040 XC = XK + (PX(1) - XLOW) * X
  SCLE + 3
1050 YC = (YHIGH - PY(1)) * YSCLE
  + YK - 2
1060 HPLOT XC,YC
1070 FOR I = 2 TO N
1080 XC = XK + (PX(I) - XLOW) * X
  SCLE + 3
1090 YC = (YHIGH - PY(I)) * YSCLE
  + YK - 2
1100 HPLOT TO XC,YC
1110 NEXT I
1120 RETURN
1130 REM
      TITLES AND LABELS
1140 HOME : PRINT : INVERSE : PRINT
  "TITLES/LABELS": NORMAL
1150 PRINT "ENTER THE ORDINATE T
  ITLE I.E.": PRINT "THE LABEL
  FOR THE Y-AXIS": INPUT "(20
  LETTERS MAX.).":YTITLES:YTI
  TLES = LEFT$ (YTITLES,20)
```

Review Data File

This subroutine allows the user to review as well as modify the existing data set, regardless of whether it was entered by keyboard or sequential text file. It was developed to allow the user to recover easily from erroneous keyboard data entry.

Sort X From Low to High

This is a simple sorting algorithm, referred to as a bubble sort. Because this bubble sort routine is only written to sort the X-variable, an additional subroutine, SWAP, has been tacked onto the sort routine. If the user wants to sort the Y-variable rather than the X-variable, the SWAP subroutine is called before the sort in order to swap X and Y. After the sort, it is called to swap X and Y again, thereby allowing a sort of the Y-variable disguised as the X-Variable.

High and Low Variable Values

This subroutine determines the high and low values for both the X and Y variables. Once the low values are

```
1160 IF LEN (YTITLES) = 0 THEN
  YTITLES = "Y-AXIS"
1170 PRINT : PRINT "ENTER THE AB
  CISSA TITLE I.E.": PRINT "TH
  E LABEL FOR THE X-AXIS": INPUT
  "(20 LETTERS MAX.).":XTITLES
  :XTITLES = LEFT$ (XTITLES,2
  0)
1180 IF LEN (XTITLES) = 0 THEN
  XTITLES = "X-AXIS"
1190 PRINT : PRINT "ENTER THE GE
  NERAL TITLE FOR THE PLOT": INPUT
  "(20 LETTERS MAX.).":TITLE$:
  TITLE$ = LEFT$ (TITLE$,20)
1200 IF LEN (TITLE$) = 0 THEN T
  ITLES = " STRING PLOTTER"
1210 XX$ = LEFT$ (XTITLES,4)
1220 IF M = 1 THEN PRINT : PRINT
  "THE ENTRY VARIABLES FOR ";
  XTITLES: PRINT "WILL BE REFÉ
  RRED TO AS ";XX$
1230 YY$ = LEFT$ (YTITLES,4)
1240 IF M = 1 THEN PRINT : PRINT
  "THE ENTRY VARIABLES FOR ";
  YTITLES: PRINT "WILL BE REFÉ
  RRED TO AS ";YY$
1250 PRINT : INPUT "ARE YOUR CHO
  ICES CORRECT THUS FAR?(Y/N)"
  ;X$:X$ = LEFT$ (X$,1)
1260 IF X$ = "N" THEN 1130
1270 RETURN
1280 REM
      FUNDAMENTAL PLOT PARAMETERS
1290 HOME : PRINT : INVERSE : PRINT
  "PLOT PARAMETERS": NORMAL
1300 SX = 0:SY = 0: PRINT "DO YOU
  WISH THE DATA SORTED ON THE
  ": PRINT "VARIABLE LABELED "
  ;XTITLES;" Y/N": INPUT X$:X
  $ = LEFT$ (X$,1)
1310 IF X$ = "Y" THEN SX = 1: GOTO
  1340
```

determined, they are adjusted slightly by subtracting 2.5 percent of the range of the X-variable (highest X-value minus lowest X-value) from the low X-value, and then subtracting four percent of the range of the Y-variable (highest Y-value minus lowest Y-value) from the low Y-variable. The purpose of this is to obtain values that are absolutely less than any observed values for the variables.

The adjusted low values are referred to as the real lower limits of the variables. They are used as "anchors," the lowest possible coordinates, when scaling the variable axes.

Save Plot From Hi-Res

This routine prompts the user for a plot file name and then saves the plot on the disk as the entered name with the expression <.PLOT> appended to it. Although the hi-res screen is typically thought of as being \$2000 bytes in length, it actually is \$1FF3. By saving a hi-res screen with a length of \$1FF3 rather than \$2000, one less disk sector is required for storage.

```

1320 PRINT : PRINT "DO YOU WISH
THE DATA SORTED ON THE": PRINT
"VARIABLE LABELED ";YTITLE$;
" Y/N";: INPUT X$:X$ = LEFT$
(X$,1)
1330 IF X$ = "Y" THEN SY = 1
1340 XD = 7: PRINT : PRINT "DO YO
U WISH TO SPECIFY THE NUMBER
OF": PRINT "DIVISIONS ON TH
E X-AXIS ";XTITLE$;"?": PRINT
"ENTER <RETURN> FOR NO ENTRI
ES": PRINT "OR ENTER THE NUM
BER OF DIVISIONS": INPUT "
";X$: IF X$ = "" THEN 1360
1350 XD = VAL (X$): IF XD < 2 OR
XD > 15 THEN PRINT : FLASH
: PRINT "ERROR IN NUMBER OF
DIVISIONS.": PRINT "YOUR CHO
ICE MUST BE GREATER THAN 1":
PRINT "AND LESS THAN 16.":X
= 0: NORMAL : GOTO 1340
1360 YD = 7: PRINT : PRINT "DO YO
U WISH TO SPECIFY THE NUMBER
OF": PRINT "DIVISIONS ON TH
E Y-AXIS ";YTITLE$;"?": PRINT
"ENTER <RETURN> FOR NO ENTRI
ES": PRINT "OR ENTER THE NUM
BER OF DIVISIONS": INPUT "
";X$: IF X$ = "" THEN GOTO
1380
1370 YD = VAL (X$): IF YD < 2 OR
YD > 15 THEN PRINT : FLASH
: PRINT "ERROR IN NUMBER OF
DIVISIONS.": PRINT "YOUR CHO
ICE MUST BE GREATER THAN 1":
PRINT "AND LESS THAN 16.":Y
D = 0: NORMAL : GOTO 1360
1380 PRINT : INPUT "ARE YOUR CHO
ICES CORRECT THUS FAR?(Y/N)"
;X$:X$ = LEFT$ (X$,1)
1390 IF X$ = "N" THEN 1280
1400 RETURN
1410 REM

```

DETERMINE PLOT TYPE

Modify Shape to be Plotted

When String Plotter is initially used, the shape which represents a point is an asterisk (*). However, any ASCII character may be substituted in its place. This subroutine allows the ASCII character that represents a point to be changed.

Scaling Procedure

Initialize The Plot is the subroutine that actually takes the input data and scales it to the Apple screen coordinates and constructs the properly scaled and labeled axes. Rather than discuss the scaling procedure in paragraph form, a detailed explanation will be provided for each important line or set of lines of code. A list of variable explanations can be found on page 33.

40-70 The first hi-res screen is turned on as a full screen and the shape table parameters are set.

100-120 The decimal precision (DP), significant digits (S), and maximum number of digits to be drawn (TF) for the numerical labels are established.

```

1420 HOME : PRINT : INVERSE : PRINT
"PLOT TYPE": NORMAL
1430 PRINT "DO YOU WISH A"
1440 PRINT " <1> POINT PLOT"
1450 PRINT " <2> LINE GRAPH"
1460 PRINT : PRINT : INPUT "ENTE
R YOUR CHOICE BY NUMBER PLEA
SE.":X$:TX = VAL ( LEFT$ (
X$,1))
1470 IF TX < 1 OR TX > 2 THEN 14
10
1480 RETURN
1490 REM

```

KEYBOARD DATA ENTRY

```

1500 HOME : PRINT "KEYBOARD DATA
ENTRY"
1510 PRINT "ENTER <END> FOR EITH
ER VARIABLE IN": PRINT "ORDE
R TO TERMINATE IF YOU": PRINT
"HAVE MISCOUNTED THE NUMBER
OF CASES."
1520 FOR I = 1 TO N
1530 VTAB 10: HTAB 1: CALL - 95
8: PRINT "CASE ";I
1540 VTAB 12: HTAB 1: CALL - 86
8: PRINT "ENTER VALUE FOR ";
XX$;" ";: INPUT X$:PX(I) =
VAL (X$)
1550 VTAB 14: HTAB 1: CALL - 86
8: IF X$ = "END" THEN NN = I
- 1:I = N: NEXT I:N = NN: GOTO
1590
1560 PRINT "ENTER VALUE FOR ";YY
$;" ";: INPUT X$:PY(I) = VAL
(X$)
1570 IF X$ = "END" THEN NN = I -
1:I = N: NEXT I:N = NN: GOTO
1590
1580 NEXT I
1590 HOME : RETURN
1600 REM

```

REVIEW DATA FILE

130-160 After accounting for the width of the shapes for the various labels, the length of the abscissa is reduced from 280 to 234 units and the length of the ordinate is reduced from 192 to 144 units. The length between axis divisions on the ordinate and on the abscissa are determined as VV and Y respectively.

170 This line always draws an unscaled ordinate that is 144 Apple screen coordinates long and an unscaled abscissa that is 234 Apple screen coordinates long. The two lines are drawn at right angles from an origin defined by the Apple screen coordinates of X=43 and Y=144.

NOTE: The logical procedure for scaling and labeling the abscissa is the same as that for the ordinate. Thus, the discussion to follow will refer to the line number corresponding to the abscissa label and also to the line number corresponding to the ordinate label unless the operation in a line is unique to a single axis.

190,440 Divide the variable range by the number of axis divisions to determine how many fixed variable units there will be between axis divisions.

200,450 Determine the actual lowest value to be placed as a label on the axis.

220,470 Determine a correction factor to account for reduction of the length of the axes in Apple screen coordinates.

230,480 Compute the constant for converting a unit of the input variable to Apple screen coordinates. That is for each unit of the input variable, "How many bit units do we have?"

240,490 Begin to place and label the X and Y divisions on the axes.

250,500 Determine the numerical value to serve as a label for the I-th axis division.

String Rounding

This total algorithm is referred to as a String Plotter because all entries on the hi-res screen are placed on the screen as shapes. Furthermore, all rounding of axis labels is done during the process of converting the number X from line 250,500 to the string Q\$. As it turns out, string rounding is substantially faster than numerical

```

1610 HOME : PRINT " REVIEW YOUR
      DATA?(Y/N)";: INPUT X$:X$ =
      LEFT$(X$,1)
1620 IF X$ < > "Y" AND X$ < >
      "N" THEN 2760
1630 IF X$ = "N" THEN RETURN
1640 HOME
1650 PRINT "PRESS <RETURN> TO AC
      CEPT AN ENTRY"
1660 PRINT "OR ENTER A REPLACEME
      NT VALUE"
1670 FOR I = 1 TO N
1680 VTAB 10: PRINT "CASE ";I
1690 VTAB 12: HTAB 1: CALL - 95
      8: PRINT XX$;" =";PX(I);: INPUT
      " ";X$: IF X$ < > "" THEN P
      X(I) = VAL(X$): GOTO 1690
1700 VTAB 14: HTAB 1: CALL - 86
      8: PRINT YY$;" =";PY(I);: INPUT
      " ";X$: IF X$ < > "" THEN P
      Y(I) = VAL(X$): GOTO 1700
1710 NEXT I
1720 HOME
1730 RETURN
1740 REM
      SORT X FROM LOW TO HIGH

1750 IF SY = 1 THEN GOSUB 1920
1760 HOME : VTAB 10: HTAB 14: FLASH
      : PRINT "SORTING DATA": NORMAL
1770 FOR I = 1 TO (N - 1)
1780 SMALL = PX(I)
1790 CASE = I
1800 FOR J = (I + 1) TO N
1810 IF PX(J) < SMALL THEN SMALL
      = PX(J):CASE = J
1820 NEXT J
1830 HOLD = PX(CASE)
1840 PX(CASE) = PX(I)
1850 PX(I) = HOLD
1860 HOLD = PY(CASE)
1870 PY(CASE) = PY(I)
1880 PY(I) = HOLD
1890 NEXT I

```

```

1900 IF SY = 1 THEN GOSUB 1920
1910 SX = 0:SY = 0: HOME : RETURN
1920 REM
      SWAP

1930 FOR I = 1 TO N
1940 HOLD = PX(I):PX(I) = PY(I):P
      Y(I) = HOLD
1950 NEXT I
1960 RETURN
1970 REM
      SUBROUTINE TO SAVE
      PLOT FROM HIRES

1980 HOME : PRINT : PRINT : PRINT
      "ENTER A PLOT FILE NAME ";: INPUT
      FILE$
1990 PRINT : PRINT "YOUR FILE WI
      LL BE SAVED AS": PRINT FILE$
      ;".PLOT"
2000 VTAB 12: PRINT : PRINT "PRE
      SS RETURN WHEN YOU HAVE THE
      DESIRED": PRINT "STORAGE DIS
      K IN THE DRIVE";: INPUT A$
2010 PRINT CHR$(4);"MONICO"
2020 PRINT CHR$(4);"BSAVE";FIL
      E$;".PLOT ,A$2000,L$1FF3"
2030 PRINT CHR$(4);"NOMONICO"
2040 RETURN
2050 REM
      MODIFY SHAPE TO BE PLOTTED

2060 HOME
2070 VTAB 10: PRINT "PRESENT PLO
      T SHAPE IS ";: PRINT CHR$(
      SHAPE + 30)
2080 VTAB 13: PRINT "ENTER THE N
      EW PLOT SHAPE ";: GET A$: PRINT
      A$:SHAPE = ASC(A$) - 30
2090 VTAB 15: PRINT "IS THIS SHA
      PE CORRECT?(Y/N)";: INPUT A$
2100 IF LEFT$(A$,1) = "N" THEN
      2050
2110 RETURN

```

rounding. The next seven lines represent this conversion process.

260,510 Place the unsigned value of X into Q.

270,520 Determine the sign of X and convert it to a string.

280,530 Determine the whole number value of X; convert it to a string and place it behind the sign.

290,540 Place the decimal point into the string.

300,550 Shift the decimal point of the number represented by Q exactly DP digits to the right so that the decimal precision is to the left of the new decimal point. Round the number and then convert it to a string.

310,560 Pick off DP digits from right to left in order to get DP decimal precision. This string, Q2\$, represents the decimal portion of X.

320,570 Concatenate the decimal portion of the number with the whole portion and the sign.

340,590 Plot the label, but plot no more than TF shapes for any one label.

350 Determine the X-coordinate for the KK-th shape of the I-th ordinate label in Apple screen coordinates. Each shape is seven units wide and the label starts at the X-coordinate value of nine so that the ordinate title will always fit between the X-coordinate values of zero to nine.

600 Determine the X-coordinate value for the KK-th shape of the I-th abscissa label in Apple screen coordinates. The width of the shape is irrelevant for this coordinate. The label always starts at the X-coordinate value of (Z-5).

360 Determine the Y-coordinate value for the KK-th shape of the I-th ordinate label in Apple screen coordinates. The width of the shape is irrelevant for this coordinate. The label always starts at the Y-coordinate value of (W+3).

610 Determine the Y-coordinate value for the KK-th shape of the I-th ordinate label in Apple screen coordinates. The width of the shape is always seven units. The label always starts at the Y-coordinate value of (W+4).

370, 630 Draw the number label Q\$ at the Apple coord-

```

2120 REM
      HIGH AND LOW
      VARIABLE VALUES

2130 YLOW = PY(1)
2140 XLOW = PX(1)
2150 YHIGH = PY(1)
2160 XHIGH = PX(1)
2170 FOR I = 2 TO N
2180 IF XHIGH < PX(I) THEN XHIGH
      = PX(I)
2190 IF YHIGH < PY(I) THEN YHIGH
      = PY(I)
2200 IF YLOW > PY(I) THEN YLOW =
      PY(I)
2210 IF XLOW > PX(I) THEN XLOW =
      PX(I)
2220 NEXT I
2230 XLOW = XLOW - (XHIGH - XLOW)
      / 40
2240 YLOW = YLOW - (YHIGH - YLOW)
      / 25
2250 RETURN
2260 REM      MAIN PROGRAM

2270 HOME : FOR I = 1 TO 39: PRINT
      "*" : NEXT I: PRINT
2280 PRINT "*" : SPC( 37) : "*" : PRINT
      "*" : SPC( 11) : "STRING PLOTTE
      R" : SPC( 12) : "*"
2290 PRINT "*" : SPC( 37) : "*"
2300 FOR I = 1 TO 39: PRINT "*" :
      : NEXT I: PRINT : POKE 34,5
2310 PRINT CHR$( 4) : "BLOAD ASCI
      I SET,A$800"
2320 POKE 232,0: POKE 233,8
2325 OVER = 0
2330 REM
      DETERMINE HOW DATA
      IS TO BE ENTERED

2340 HOME : PRINT : INVERSE : PRINT
      "ENTRY": NORMAL
2350 PRINT "WILL YOUR DATA BE EN
      TERED BY"

2360 PRINT "      <1> KEYBOARD"
2370 PRINT "      <2> SEQUENTIAL
      TEXT FILE": PRINT "      AS
      SUME PAIRED DATA ENTRY": PRINT
      "      FIRST X-VALUE AND THE
      N Y-VALUE"
2380 PRINT
2390 INPUT "ENTER YOUR CHOICE BY
      NUMBER.": X$: M = VAL (X$):
      IF M < 1 OR M > 2 THEN 2330
2400 IF M = 1 THEN PRINT "KEYBO
      ARD ENTRY"
2410 IF M = 2 THEN PRINT " SEQU
      ENTIAL TEXT FILE ENTRY"
2420 IF NOT OVER THEN PRINT : PRINT
      : PRINT "ESTIMATE THE MAXIMU
      M NUMBER OF CASES": INPUT "(
      PAIRED OBSERVATIONS) TO BE E
      NTERED.": N$: N = VAL (N$): IF
      N < 1 THEN 2420
2430 PRINT : INPUT "ARE YOUR CHO
      ICES CORRECT THUS FAR?(Y/N)"
      : X$: X$ = LEFT$ (X$,1)
2440 IF X$ = "N" THEN 2340
2450 IF OVER THEN 2500
2460 GOSUB 1130
2470 GOSUB 1280
2480 GOSUB 1410
2490 DIM PY(N),PX(N)
2500 IF M = 1 THEN GOSUB 1490: GOTO
      2760
2510 REM
      READ A SEQUENTIAL TEXT FILE

2520 POKE 34,5: HOME : PRINT "PR
      EPARING TO ENTER DATA VIA DI
      SK FILE"
2530 PRINT : PRINT "PLACE THE DA
      TA DISK INTO THE DRIVE": INPUT
      "AND PRESS <RETURN>": X$:
2540 : PRINT "ENTER THE DATA FILE
      NAME PLEASE " : INPUT FILE$
      : IF LEN (FILE$) = 0 THEN 2
      540
2550 HOME

```

dinate position XC,YC. When labeling the abscissa, rotate the shape before plotting it (line 620).

390-410, 650-680 Compute the Apple coordinate positions for the slash to be placed through the axis to denote the division point. The logic is the same as that for the axis labels.

730-800,810-870,880-940 Place blank spacing into the "title" so that it will be centered on the plot. Determine the X and Y coordinates for the bit point at which to start drawing the title.

Draw / Connect the Points

These two subroutines either draw a shape at the

```

2560 PRINT "FILE NAME IS ";FILE$
2570 ONERR GOTO 2590
2580 PRINT CHR$(4);"VERIFY";FILE$;
GOTO 2640
2590 HOME : VTAB 10: PRINT "FILE
";: INVERSE : PRINT FILE$;
; NORMAL : PRINT " NOT FOUND
"
2600 PRINT "ENTER A NEW NAME": PRINT
"OR <CATALOG> FOR A CATALOG
OF THIS DISK": INPUT "OR <RE
TURN> AFTER CHANGING DISKS";
X$
2610 IF X$ = "CATALOG" THEN PRINT
CHR$(4);"CATALOG": GOTO 26
00
2620 IF X$ = "" THEN HOME : GOTO
2580
2630 FILE$ = X$: GOTO 2550
2640 VTAB 10: HTAB 12: PRINT "RE
ADING YOUR FILE"
2650 PRINT CHR$(4);"OPEN";FILE
$
2660 PRINT CHR$(4);"READ";FILE
$
2670 ONERR GOTO 2740
2680 I = 0
2690 I = I + 1
2700 IF I > N THEN 2740
2710 INPUT PX(I)
2720 INPUT PY(I)
2730 GOTO 2690
2740 N = I - 1
2750 PRINT CHR$(4);"CLOSE";FILE
E$
2760 HOME : POKE 216,0: IF OVER THEN
OVER = 0: GOSUB 2050: POKE -
16297,0: POKE - 16304,0: GOSUB
960: GOTO 2850: REM SOFT RE
ENTRY FOR OVERLAY PLOT
2770 GOSUB 1600
2780 IF SX = 1 OR SY = 1 THEN GOSUB
1740
2790 SHAPE = 12
2800 GOSUB 2120
2810 GOSUB 30
2820 IF TX = 1 THEN GOSUB 960
2830 IF TX = 2 THEN GOSUB 1030
2840 REM
ROUTINE TO REVIEW
AND MODIFY PLOT
2850 INPUT JUNK$
2860 POKE - 16303,0
2870 HOME : PRINT : PRINT
2880 PRINT " <1> SAVE THE PLOT
TO DISK"

```

coordinates representing a data point (lines 970-1020) or H PLOT lines between consecutively plotted points (lines 1040-1120).

980,1080 Determine the X-coordinate in Apple screen coordinates for point I. Determine the difference between the real lower limit and the X-value for point I. Convert this value to Apple screen coordinates by multiplying it by XSCLE, the X conversion factor. Add to this converted value the value that represents the actual bit starting coordinate, XK. The conversion factor, XSCLE, is computed to correspond to the center of the plotted shapes. The shape centers are not in exactly the same place as the points that are plotted. Thus, a three is

```

2890 PRINT " <2> MODIFY TYPE OF
PLOT"
2900 PRINT " <3> REVIEW/MODIFY
DATA"
2910 PRINT " <4> ALTER AXIS DIV
ISIONS"
2920 PRINT " <5> SORT/RESORT TH
E DATA"
2930 PRINT " <6> CHANGE THE PLO
T SHAPE"
2940 PRINT " <7> ALTER THE NUMB
ER OF POINTS"
2950 PRINT " <8> SHOW ME THE SA
ME PLOT AGAIN"
2960 PRINT " <9> RE-PLOT THE DA
TA"
2970 PRINT " <10> MODIFY TITLES
"
2980 PRINT " <11> ENTER OVERLAY
DATA"
2990 PRINT " <12> QUIT"
3000 PRINT : PRINT
3010 PRINT "ENTER YOUR CHOICE BY
NUMBER..": INPUT " ";A$
3020 A = VAL (A$): IF A < 1 OR A
> 12 THEN 2870
3030 IF A = 1 THEN GOSUB 1970: GOTO
2870
3040 IF A = 2 THEN GOSUB 1410: GOTO
2870
3050 IF A = 3 THEN GOSUB 1600: GOTO
2870
3060 IF A = 4 THEN HOME : GOSUB
1340: GOSUB 2120: GOTO 2870
3070 IF A = 5 THEN GOSUB 1280: GOSUB
1740: GOTO 2870
3080 IF A = 6 THEN GOSUB 2050: GOTO
2870
3090 IF A = 7 THEN HOME : VTAB
10: PRINT "ENTER THE NEW NUM
BER OF OBSERVATIONS (LESS TH
AN ";NN;").": INPUT N$:N =
VAL (N$): IF N < 2 OR N > N
N THEN 3090
3100 IF A = 8 THEN POKE - 1629
7,0: POKE - 16304,0: GOTO
2830
3110 IF A = 9 THEN 2810
3120 IF A = 10 THEN GOSUB 1130:
GOTO 2870
3130 IF A = 11 THEN OVER = 1: GOTO
2330
3140 IF A = 12 THEN TEXT : HOME
: END
3150 GOTO 2870
3160 REM
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```



added to the value when plotting a point instead of a shape.

990,1090 Determine the Y-coordinate in Apple screen coordinates for the I-th point. Compute the difference between this value and the highest Y-value for the variable. Convert this value to Apple screen coordinates by multiplying it by YSCLE, the Y conversion factor. Add to this the value that represents the actual bit starting point for the Y-axis, YK. If points are being plotted, subtract two from this value to accommodate centering a point rather than a shape.

1000,1100 Either draw the shape or connect the points.

Routine to Review and Modify Plot

Once the data are plotted, it may be necessary to alter the plot. You can save the plot to disk in order to print it out or even change the shape of the point to be plotted. Pressing any key will result in the display of a modification menu that will allow the user to modify plot parameters or data. The plot parameters, as well as the other options of the menu, are invoked through the use of subroutines, many of which have already been explained. The menu is extremely flexible and can be easily modified.

Graphic Overlay

A very basic graphic overlay procedure is included with String Plotter. The procedure, rather than being a single subroutine, involves the use of existing subroutines in a unique order.

First a flag variable, OVER, is set equal to one (line 3120), and then the procedure goes to line 2340 for new data entry. Data previously entered are lost. The number of paired coordinate points may not be greater than the number of paired coordinate points entered for the first data set. Therefore, the user is not prompted for an overestimate of the number of cases after the first set of data has been entered.

The data are entered and then the user is allowed to modify the plot shape (line 2760). The new data are plotted over the existing plot through the subroutine CALL at line 2760.

Finally, after the data have been plotted, the procedure goes to line 2850 to await a key press.

Final Considerations

String Plotter has been written so that the shape table is loaded into \$800 and the actual program is loaded above hi-res page one. Line 10 checks to see that the Applesoft pointers to the beginning of the program have been modified to load the program above hi-res page one.

If PEEK(104) is not greater than 64, locations 103 and 104 are modified to load the program one byte past the beginning of hi-res page two, and location 16384 (the beginning of hi-res page two) is set equal to zero.

Once these pointers have been properly set, String

Plotter is rerun, which effectively reloads the program above hi-res page one prior to actually running the program. The plotting is then done on hi-res page one and the shape table is loaded at \$800.

The shape table may be placed anywhere. It is loaded at line 2310 and its location is POKEd in at line 2320. Only these two lines need to be modified if the location of the shape table is altered.

Plotting may be done on hi-res page two, instead of page one. To enable this, line 40 should be modified to HGR2, and the \$2000 in line 2020 should be changed to \$4000. Of course the Applesoft pointers at memory locations 103 and 104 will have to be modified at line 10 since they presently load the String Plotter program into hi-res page two. The String Plotter can be placed almost anywhere between \$800 and \$9800 if MAXFILES is set to one, and its placement does not conflict with the placement of the shape table and the hi-res screen on which the plotting is being done.

I have presented a skeleton of a general algorithm that provides professional-quality plotting on the Apple. Other programmers might want to add to String Plotter. For instance, it would be quite simple to refine the overlay graphic. I suspect that colored bar charts would not be too difficult to implement now that the scaling problem is solved. Also, keyboard entered data can be saved as a text file.



Checksums for String Plotter

Configuration 1

10 - \$CD93	270 - \$7EA2	530 - \$41BF
20 - \$9EF3	280 - \$574B	540 - \$560A
30 - \$05EA	290 - \$4DAC	550 - \$CED1
40 - \$5BC9	300 - \$E74A	560 - \$AE1C
50 - \$7C76	310 - \$3607	570 - \$80CD
60 - \$363E	320 - \$849D	580 - \$2A5A
70 - \$AEEF	330 - \$C6BD	590 - \$7BCE
80 - \$AD8D	340 - \$537A	600 - \$0280
90 - \$DD09	350 - \$E012	
100 - \$5ED3	360 - \$BB99	610 - \$6086
110 - \$6071	370 - \$C9C8	620 - \$AB00
120 - \$19A8	380 - \$9E35	630 - \$1D47
130 - \$5754	390 - \$D199	640 - \$D4E2
140 - \$214B	400 - \$9D62	650 - \$1850
150 - \$5397		660 - \$36D8
160 - \$256D	410 - \$F042	670 - \$D591
170 - \$93F2	420 - \$13FE	680 - \$40D2
180 - \$C0D0	430 - \$9670	690 - \$79F1
190 - \$0455	440 - \$3B43	700 - \$BA82
200 - \$E491	450 - \$2B49	710 - \$79C7
	460 - \$36FE	720 - \$290A
210 - \$666A	470 - \$6B04	730 - \$6DC6
220 - \$7ABE	480 - \$63F9	740 - \$C396
230 - \$2C0D	490 - \$BA86	750 - \$84D2
240 - \$4A35	500 - \$B6B9	760 - \$566A
250 - \$BA74	510 - \$651E	770 - \$07A4
260 - \$C4C3	520 - \$911C	780 - \$6B7C

790 - \$B002	1060- \$262F	1340 - \$8C7B		2130 - \$B9B1	2640 - \$CA3C
800 - \$33AA	1070- \$728F	1350 - \$E64B	1610 - \$138D	2140 - \$E2E6	2650 - \$4BD4
	1080- \$27A0	1360 - \$A652	1620 - \$7CA5	2150 - \$1CBE	2660 - \$99BF
810 - \$C140	1090- \$03DD	1370 - \$AFE6	1630 - \$E543	2160 - \$D378	2670 - \$73A3
820 - \$7C61	1100- \$1EBC	1380 - \$F104	1640 - \$5F5E	2170 - \$1D0E	2680 - \$7DCD
830 - \$205B	1110- \$4D48	1390 - \$63A8	1650 - \$429C	2180 - \$EDCC	2690 - \$3DB6
840 - \$F787	1120- \$3B45	1400 - \$492E	1660 - \$9DD2	2190 - \$14E0	2700 - \$FE46
850 - \$BBB8	1130- \$9961		1670 - \$A034	2200 - \$63B6	2710 - \$F486
860 - \$B13E	1140- \$F7DC	1410 - \$6CA8	1680 - \$F73B		2720 - \$BDC3
870 - \$5976	1150- \$9779	1420 - \$2A4F	1690 - \$236C	2210 - \$175E	2730 - \$52E3
880 - \$3447	1160- \$DEA8	1430 - \$5773	1700 - \$B289	2220 - \$899C	2740 - \$0268
890 - \$457E	1170- \$941A	1440 - \$4989	1710 - \$7D2C	2230 - \$C9A7	2750 - \$D43E
900 - \$4A3C	1180- \$93CA	1450 - \$32C2	1720 - \$0CB0	2240 - \$A743	2760 - \$5B7A
910 - \$12DE	1190- \$1A2D	1460 - \$F48E	1730 - \$A6E7	2250 - \$FA1C	2770 - \$9FAE
920 - \$03BE	1200- \$3A3C	1470 - \$392E	1740 - \$C6D1	2260 - \$4A39	2780 - \$92F8
930 - \$5A78		1480 - \$C728	1750 - \$408D	2270 - \$0B71	2790 - \$8E12
940 - \$3F58	1210 - \$076D	1490 - \$429A	1760 - \$7C22	2280 - \$B6C1	
950 - \$AE1F	1220 - \$31AC	1500 - \$8C7A	1770 - \$30C8	2290 - \$428C	2800 - \$72F8
960 - \$A612	1230 - \$F1CD	1510 - \$BD15	1780 - \$5E1F	2300 - \$7D4F	2810 - \$A838
970 - \$7CF4	1240 - \$0C5A	1520 - \$9AB0	1790 - \$7692	2310 - \$307F	2820 - \$6FDB
980 - \$3BFD	1250 - \$64AA	1530 - \$1026	1800 - \$B04B	2320 - \$0F43	2830 - \$44FA
990 - \$29A0	1260 - \$F012	1540 - \$FCAE		2325 - \$75D8	2840 - \$F34E
1000 - \$51C6	1270 - \$B9DF	1550 - \$FC7D	1810 - \$AA50	2330 - \$DCF8	2850 - \$1E8B
	1280 - \$D13F	1560 - \$F187	1820 - \$E69A	2340 - \$91BE	2860 - \$0F6A
1010 - \$393F	1290 - \$6A57	1570 - \$81A7	1830 - \$E5CB	2350 - \$DF1A	2870 - \$1C06
1020 - \$4D7E	1300 - \$82FB	1580 - \$972A	1840 - \$7CDF	2360 - \$DD2D	2880 - \$69C5
1030 - \$4E57	1310 - \$D84A	1590 - \$0033	1850 - \$503E	2370 - \$BC2E	2890 - \$CF34
1040 - \$53D8	1320 - \$EE3A	1600 - \$4219	1860 - \$1026	2380 - \$EA7A	2900 - \$3820
1050 - \$175D	1330 - \$92D6		1870 - \$BB3F	2390 - \$77DF	2910 - \$53BC
			1880 - \$2F6E		2920 - \$9BDE
			1890 - \$E78D	2400 - \$B921	2930 - \$21CF
			1900 - \$9CF4	2410 - \$4E25	2940 - \$0F54
			1910 - \$5004	2420 - \$1F68	2950 - \$8896
			1920 - \$2B86	2430 - \$F8C4	2960 - \$9D20
			1930 - \$4102	2440 - \$9381	2970 - \$C398
			1940 - \$E132	2450 - \$3B91	2980 - \$E903
			1950 - \$7721	2460 - \$EDD6	2990 - \$C4F6
			1960 - \$01B2	2470 - \$840F	
			1970 - \$0582	2480 - \$8359	3000 - \$0CAB
			1980 - \$F754	2490 - \$B63C	3010 - \$273D
			1990 - \$5018	2500 - \$C27F	3020 - \$AFA1
			2000 - \$6E01	2510 - \$0F1F	3030 - \$BF3B
				2520 - \$3213	3040 - \$C55C
			2010 - \$24C3	2530 - \$EBF8	3050 - \$2FCD
			2020 - \$6FDB	2540 - \$9714	3060 - \$20D8
			2030 - \$5861	2550 - \$A536	3070 - \$18C0
			2040 - \$7929	2560 - \$CE20	3080 - \$7ED9
			2050 - \$EB1B	2570 - \$9284	3090 - \$7395
			2060 - \$9C2C	2580 - \$F83D	3100 - \$C232
			2070 - \$324B	2590 - \$B246	3110 - \$8C08
			2080 - \$807D		3120 - \$B3FA
			2090 - \$8499	2600 - \$989E	3130 - \$99E7
			2100 - \$42B8	2610 - \$D65A	3140 - \$2E9D
			2110 - \$1509	2620 - \$FC33	3150 - \$3C5D
			2120 - \$0336	2630 - \$A6BC	3160 - \$053F

Explanation of Subroutine CALLs or Special Lines

GOSUB 30 hi-res initialization
GOSUB 960 plot points
GOSUB 1030 plot line
GOSUB 1280 enter title and axis labels
GOSUB 1410 determine plot type
GOSUB 1490 enter data via keyboard
GOSUB 1600 review data entered
GOSUB 1740 sort variable X
GOSUB 1920 swap X and Y
GOSUB 1970 save hi-res screen to disk
GOSUB 2050 modify shape to be plotted
GOSUB 2120 determine high and low variable values
line 2260 enter main program
line 2510 read a sequential file
line 2850 await keypress to enter modification menu

For information on SoftKey's Checksums, see the Table of Contents.

ASCII Set (for String Plotter)

BEG: D00 END: 1157

```

0D00- 96 42 30 01 55 01 57 01 : $1D54
0D08- 5F 01 68 01 7A 01 89 01 : $69E4
0D10- 97 01 A5 01 AD 01 B6 01 : $C32F
0D18- BF 01 CD 01 D7 01 DC 01 : $11FE
0D20- E3 01 E7 01 EE 01 FF 01 : $5B33
0D28- 08 02 15 02 23 02 2F 02 : $4BE0
0D30- 3C 02 4A 02 53 02 63 02 : $3AE4
0D38- 6F 02 74 02 79 02 83 02 : $EC67
0D40- 8D 02 96 02 A2 02 B1 02 : $2609
0D48- C0 02 D1 02 DE 02 EB 02 : $CACF

0D50- FB 02 07 03 17 03 26 03 : $C16C
0D58- 30 03 3B 03 48 03 57 03 : $22B1
0D60- 65 03 73 03 81 03 8D 03 : $2717
0D68- 9D 03 AC 03 BC 03 C8 03 : $D54A
0D70- D8 03 E6 03 F6 03 04 04 : $28DB
0D78- 11 04 23 04 2D 04 36 04 : $42EE
0D80- 3F 04 47 04 49 04 55 04 : $909C
0D88- 59 04 00 00 00 00 00 : $FCAF
0D90- 00 00 00 00 00 00 00 : $BC9F
0D98- 00 00 00 00 00 00 00 : $FCAF

0DA0- 00 00 00 00 00 00 00 : $BC9F
0DA8- 00 00 00 00 00 00 00 : $FCAF
0DB0- 00 00 00 00 00 00 A0 B0 : $1C67
0DB8- 00 C0 81 00 00 FF FF 00 : $425C
0DC0- 00 00 00 00 00 00 00 : $E29C
0DC8- 00 00 00 00 00 00 00 : $425C
0DD0- 00 00 00 00 00 00 00 : $E29C
0DD8- 00 00 00 00 E0 9F 00 00 : $8FAD
0DE0- E0 FF FF 9F E0 FF BF FB : $0F93
0DE8- FB 00 B8 00 00 00 00 00 : $4E0A

0DF0- 00 00 00 00 00 00 00 : $2E2A
0DF8- 00 09 00 00 00 00 00 : $1F6C
0E00- 00 00 00 00 00 00 00 : $2F2C
0E08- 00 00 00 00 00 00 00 : $1F6C
0E10- 00 00 00 00 00 00 00 : $2F2C
0E18- 00 00 00 00 00 00 00 : $1F6C
0E20- 00 00 00 00 00 00 00 : $2F2C
0E28- 00 00 00 00 00 00 00 : $1F6C
0E30- 24 24 24 24 2C 36 36 36 : $FC6A
0E38- 36 2E 24 24 24 24 2C 36 : $938E

0E40- 36 36 36 2E 24 24 24 24 : $B914
0E48- 2C 36 36 36 36 2E 24 24 : $238B
0E50- 24 24 24 00 00 01 00 09 : $5FAB
0E58- 04 20 24 24 00 2D 00 00 : $261D
0E60- 18 00 18 00 6C 36 00 00 : $90C6
0E68- 21 24 24 34 3E 2D 2D 27 : $8BF9
0E70- 34 36 36 26 2C 3F 3F 07 : $5916
    
```

```

0E78- 00 4C 28 2D 05 E0 3F 07 : $E0A7
0E80- 60 2D E5 33 36 36 00 : $9E0E
0E88- 49 49 25 F7 1B 60 0C 0C : $2B00

0E90- 0C DC 3B 2E 04 00 29 29 : $99A7
0E98- 0D C5 63 DD 83 1C 0C E4 : $630A
0EA0- 17 B6 B6 00 29 08 08 18 : $E333
0EA8- 08 20 05 00 09 09 1C 1C : $0423
0EB0- 24 05 60 05 00 09 09 0C : $7908
0EB8- 0C 24 1C 1C 07 00 60 60 : $5AFD
0EC0- 04 E0 4C 36 36 36 0D E0 : $2B84
0EC8- 04 60 04 00 28 09 20 24 : $0EB4
0ED0- 34 3E 2F 2D 2D 00 0D 29 : $8B8A
0ED8- 20 00 3F A2 08 18 28 2D : $09C6

0EE0- 2D 00 91 04 00 3B F9 60 : $02FA
0EE8- 0C 0C 0C 04 00 49 20 24 : $B75E
0EF0- 64 2D 15 36 36 1E 3F 07 : $433B
0EF8- 20 2D 28 28 05 00 85 29 : $CD37
0F00- 3D 24 24 24 3E 07 00 0D : $7609
0F08- 2D 2D 3F 27 0C 0C 0C E4 : $DBA0
0F10- 3F 17 07 00 03 A8 2D 05 : $F0FD
0F18- 20 1C 2F 05 20 1C 3F 17 : $E278
0F20- 07 00 C5 49 24 24 24 36 : $8AB1
    
```

```

0F28- 2E 3F 3F 24 24 00 A2 A8 : $F2BB

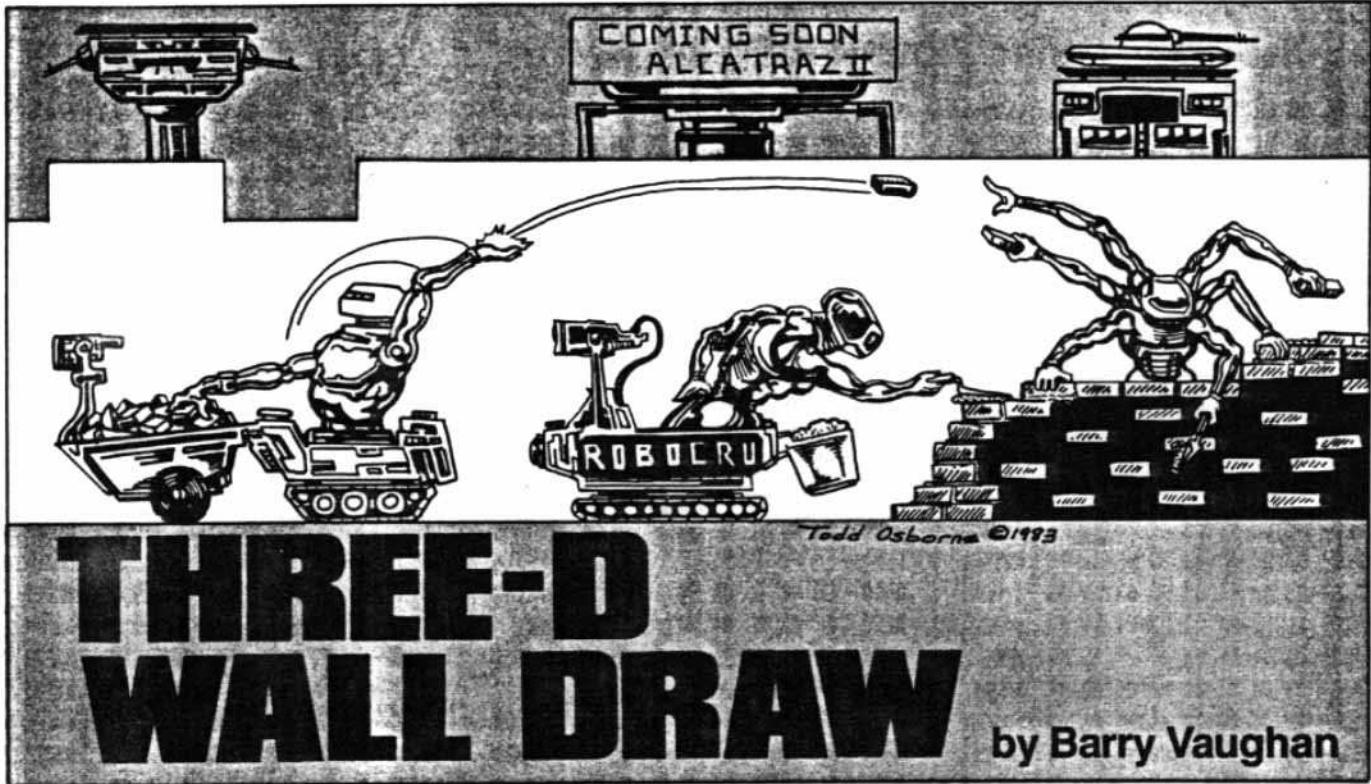
0F30- 2D 05 20 1C 3F 27 24 2D : $487E
0F38- 2D 05 00 85 29 2D 20 1C : $CB6A
0F40- 3F 37 26 24 0C 05 28 2D : $4068
0F48- 00 91 21 64 0C 0C 3C 3F : $10E0
0F50- 3F 00 A4 29 2D 20 1C 3F : $5F3F
0F58- 17 36 20 04 20 0C 2D 15 : $F986
0F60- 36 00 91 2D 28 20 25 E4 : $6962
0F68- 3F 17 76 2D 05 00 20 09 : $0ECB
0F70- 04 20 00 D0 29 20 20 00 : $4036
0F78- 49 49 1C 1C 1C 0C 0C 0C : $B3AF

0F80- 05 00 F0 08 38 2D 2D 04 : $C069
0F88- 38 3F 3F 00 C9 61 0C 0C : $6BA2
0F90- 1C 1C 1C 07 00 C9 09 04 : $5FFA
0F98- 20 2D 20 1C 3F 17 06 00 : $2BA6
0FA0- 34 C9 29 2D C5 DB 23 24 : $63A4
0FA8- 64 2D 15 36 1E 27 34 00 : $2227
0FB0- 60 24 24 0C 0C 15 15 36 : $7121
0FB8- 3F 2F 2D 36 06 00 05 86 : $ECC5
0FC0- 2D 2D 20 1C 3F 2F 2D 05 : $283D
0FC8- 20 1C 3F 37 36 36 06 06 : $606D
    
```

continued on page 40

Explanation of the Variables

- | | | | |
|----------------|---|-----------------|--|
| C— | increment size for axis division on axis being plotted. | TITLES— | main heading (max 20 char). |
| DP— | decimal precision of numeric label after rounding. | W— | maximum length of the ordinate. |
| N— | number of paired points to be plotted. | X— | digit to be drawn. |
| OVER— | when equal to 1, used in the main program to signify a plot overlay. | XC— | abscissa coordinate for shape to be drawn. |
| PX()— | abscissa coordinate values. | XD— | desired number of abscissa divisions (max 15). |
| PY()— | ordinate coordinate values. | XHIGH— | highest possible abscissa value. |
| Q— | absolute value of X. | XLOW— | lowest possible abscissa value. |
| S— | maximum number of possible characters (including decimal and sign) after a number is rounded and converted to a string. | XTITLES— | abscissa title (max 20 char). |
| SHAPE— | number of the shape to be drawn. | (XY-1)— | number of divisions on axis being plotted. |
| SX, SY— | flag variables to signify a variable sort on either X or Y, respectively, if set equal to one. | YC— | ordinate coordinate for the shape to be drawn. |
| TF— | truncation factor representing the maximum number of digits to be drawn for any number. | YD— | desired number of ordinate divisions (max 15). |
| | | YHIGH— | highest possible ordinate value. |
| | | YLOW— | lowest possible ordinate value. |
| | | YTITLES— | ordinate title (max 20 char). |
| | | Z— | actual starting location for the abscissa. |



REQUIREMENTS:

- Applesoft in ROM, 48K
- One disk drive

3-D Wall Draw is an 11-sector Applesoft BASIC program which demonstrates one way of creating 3-D images with Apple hi-res graphics. The program originally drew lines but evolved to draw 3-D planes of various spacing and depth in normal or inverse display. Any image can be printed or saved to disk.

Using 3-D Wall Draw

- 1) Type in the program listing for 3-D Wall Draw.
- 2) **SAVE WALL DRAW**
- 3) Run the program. It will display the title and, after a short pause, a summary of the keyboard commands (see Figure 1).
- 4) Answer the questions which appear on screen.

**DO YOU WANT: (1) BLACK ON WHITE
(2) WHITE ON BLACK**

It is easier to see white on black.

ENTER DEPTH OF WALL

For a beginner who just wants to see what this program does, a depth of 25 to 30 is recommended.

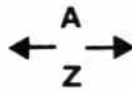
ENTER SPACING BETWEEN LINES

A line spacing of four is recommended.

After answering the last question, an HGR2 places you on the second page of hi-res graphics. A line will

appear near the center of the screen to indicate that 3-D Wall Draw is ready to start drawing. The line also indicates where the drawing of the first wall will begin.

Directions



A Move plane. You will see the line move a certain number of spaces (the line spacing number mentioned earlier) in one of the four directions. Any of these keys may also be pressed to restart the drawing of the plane after it has been stopped with the space bar.

SPACE Stop plane.

S Save file. If pressed while the plane is being drawn, the screen will flick to the text mode and you will be asked a series of questions about the saving of a file to disk.

L Load file. If pressed while the plane is being drawn, the screen will flick to the text mode and you will be asked a series of questions about the loading of a file from a disk. After the file is loaded, the program will ask if it is the right file. If you type Y, it may seem like the program is rerunning, but it isn't. If you type N, the program will ask for the file name of the picture again. The program will then load that file. The picture is saved as a 34-sector binary file.

Q Quit program. If pressed while the plane is being drawn, the screen will flick to the text mode and the word "bye" will be displayed.

List of Variables

There are 19 variables which have a direct effect on the outcome of the picture.

LK	depth of plane
X	X coordinate for "back" of plane
Y	Y coordinate for "back" of plane
A	PEEK for telling which key was pressed. PEEK(-16384)
CC	screen color (1—black on white; 2—white on black)
OP	check variable to see if a picture has been loaded (999—yes; 2—no)
CV	X coordinate for "front" of plane
VC	Y coordinate for "front" of plane
G	X coordinate at previous position (back)
H	Y coordinate at previous position (back)
J	X coordinate at previous position (front)
K	Y coordinate at previous position (front)
F	line spacing
NM\$	file name in save subroutine
SL	slot number in save and load subroutines
Q\$	confirming question in save subroutine
DN	drive number in load subroutine
UI\$	file name in load subroutine
QW\$	confirming question in load subroutine

How The Program Works

After the questions which determine the format of the drawing have been answered, the LK, X, Y, CC, and F variables are initialized. The other variables, except for the load/save variables, are initialized when one of the directional keys are pushed.

The X and Y variables are initialized with the values of 140 and 95, respectively.

Before the depth-of-plane variable can be used, the value of the variable must be divided by 100, and added to one ($LK = (LK/100) + 1$).

The CV variable is initialized with the product of the value of the X-variable times the depth-of-plane (LK). Likewise, the VC-variable is initialized with the product of the value of the Y-variable times the depth of plane.

The program then HPLOTS from (X,Y) to (CV,VC). This forms the base line for the plane.

Then the G, H, L, and K variables are initialized with the values of X, Y, CV, and VC, respectively. If the K-variable equals one, then it is set to 191. The program next HPLOTS (G,H) to (X,Y), and (J,K) to (CV,VC).

At this point, the program has completed one cycle of the HPLOTting function, and will GOTO the point in the program in which the keyboard is read. The cycle is repeated until it is disrupted by a save/load command or a quit command (Q).

Three-D Wall Draw

```

10 GOSUB 500
20 INPUT "INPUT DEPTH OF PLANE(1
   -100)";LK
30 LK = INT ( ABS (LK))
40 IF LK < 1 OR LK > 100 THEN 20
50 LK = LK / 100: IF LK < .01 THEN
   LK = .01
60 LK = LK + 1: IF LK > 2 THEN LK
   = 2
70 INPUT "ENTER SPACING BETWEEN
   LINES(4 IS RECOMMENDE
   D.)";F
80 F = INT ( ABS (F))
90 IF F < 1 THEN 70
100 IF OPO = 999 THEN 140
110 X = 0:Y = 0:A = 0:CV = 0:VC =
   0:G = 0:H = 0:J = 0:K = 0
120 HGR2
130 GOTO 160
140 X = PEEK ( - 16304):X = PEEK
   ( - 16297):X = PEEK ( - 162
   99)
150 OPO = 0: GOTO 170
160 IF CCC = 1 THEN HCOLOR= 7: HPL0T
   0,0 TO 279,191: CALL 62454:
   HCOLOR= 0: GOTO 190
170 IF CCC = 1 THEN HCOLOR= 0: GOTO
   190
180 HCOLOR= 7
190 X = 140
200 Y = 95
210 A = PEEK ( - 16384)
220 IF A = 209 THEN 630
230 IF A = 211 THEN 650
240 IF A = 204 THEN 790
250 IF A = 160 THEN X = X:Y = Y
260 IF Y = 0 THEN Y = 190:H = 19
   1: GOTO 280
270 IF A = 193 THEN Y = Y - F
280 IF Y = 191 THEN Y = 1:H = 0:
   GOTO 300

```

Figure 1

COMMANDS	
A	UP
Z	DOWN
←	LEFT
→	RIGHT
S	SAVE picture to disk
L	LOAD picture from disk
SPACE	STOP drawing of plane
Q	QUIT

```

290 IF A = 218 THEN Y = Y + F
300 IF X = 0 THEN X = 278:G = 27
    9: GOTO 320
310 IF A = 136 THEN X = X - F
320 IF X = 279 THEN X = 1:G = 0
330 IF A = 149 THEN X = X + F
340 IF Y > 191 THEN Y = 191
350 CV = X * LK:VC = Y * LK
360 IF X > 279 THEN X = 279
370 IF X < 0 THEN X = 0
380 IF CV > 279 THEN CV = 279
390 IF CV < 0 THEN CV = 0
400 IF VC > 191 THEN VC = 191
410 IF VC < 0 THEN VC = 0
420 IF Y < 0 THEN Y = 0

```

```

430 H PLOT X,Y TO CV,VC
440 IF G = 0 OR H = 0 OR J = 0 OR
    K = 0 THEN 470
450 H PLOT G,H TO X,Y
460 H PLOT J,K TO CV,VC
470 G = X:H = Y:J = CV:K = VC
480 GOTO 210
490 TEXT : HOME : SPEED= 255: NOTRACE
    : NORMAL
500 VTAB 3
510 PRINT "*****
    *"
520 PRINT "** THREE-D WALL DRAW
    *"
530 PRINT "** BY BARRY VAUGHAN
    *"
540 PRINT "*****
    *"
550 PRINT : PRINT : PRINT : PRINT
    : FOR R = 1 TO 2000: NEXT R
560 PRINT "INSTRUCTIONS FOR THREE
    E-D PLANE DRAW. "
570 PRINT " A UP"
580 PRINT " Z DOWN"
590 PRINT " <-- LEFT"
600 PRINT " --> RIGHT"
610 PRINT " Q QUIT"
620 PRINT " S SAVE PICTURE TO
    DISK "
630 PRINT " L LOAD PICTURE FROM
    DISK"
640 PRINT " SPC TEMPORARILY STOP
    PLANE"
650 PRINT
660 INPUT "DO YOU WANT (1)- BLACK
    ON WHITE
    (2)- WHITE ON BLACK
    ";CCC
670 CCC = INT (CCC): IF CCC < 1 OR
    CCC > 2 THEN 660
680 RETURN
690 TEXT : HOME : GET A$: VTAB (
    8): PRINT "BYE."
700 END
710 GET A$
720 POKE 216,0: ONERR GOTO 1040
730 TEXT : HOME : VTAB (2): INPUT
    "INPUT FILE NAME: ";NM$
740 INPUT "INPUT SLOT NUMBER: ";S
    L
750 SL = INT (SL)
760 IF SL < 1 OR SL > 7 THEN 740
770 INPUT "INPUT DRIVE NUMBER: ";
    DN
780 DN = INT (DN)
790 IF DN < 1 OR DN > 2 THEN 770

```

Limitations and Improvements: Diagonal Walls

One possible improvement is to give the program the ability to draw diagonal planes. This can be done by changing four lines and adding four lines.

Change the following lines to:

```

270 IF A = 212 THEN Y = Y - F
290 IF A = 194 THEN Y = Y + F
310 IF A = 198 THEN X = X - F
330 IF A = 200 THEN X = X + F

```

Also add the following four lines:

```

275 IF A = 217 THEN X = X + F:Y = Y - F
295 IF A = 210 THEN X = X - F:Y = Y - F
315 IF A = 214 THEN X = X - F:Y = Y + F
335 IF A = 206 THEN X = X + F:Y = Y + F

```

These changes and additions make it possible to use the commands shown in Figure 2.

The only real limitation is the effect of alterations to the 3-D plane on the program's speed. For example, if the above lines are added, speed will be noticeably reduced.

3-D Wall Draw provides an entertaining way to draw 3-D images on the Apple. It also demonstrates intriguing ways to manipulate these images and can provide new ideas for personal programs.

Figure 2

COMMANDS	
F	LEFT
H	RIGHT
T	UP
R	UP & LEFT
Y	UP & RIGHT
B	DOWN
V	DOWN & LEFT
N	DOWN & RIGHT

```

800 PRINT "ARE YOU SURE THAT YOU
      WANT TO SAVE THIS PICTURE?"
      ;: GET Q$: PRINT : IF Q$ < >
      "Y" THEN RUN
810 PRINT CHR$ (4)"BSAVE ";NM$;
      ",S";SL;","D";DN;","A$4000,L$2
      000"
820 PRINT "DONE."
830 FOR R = 1 TO 1000: NEXT R
840 RUN
850 TEXT : HOME : VTAB (2)
860 GET AZ$
870 POKE 216,0: ONERR GOTO 1020
880 INPUT "INPUT SLOT NUMBER:";S
      L
890 SL = INT ( ABS (SL)): IF SL <
      1 OR SL > 7 THEN 880
900 INPUT "INPUT DRIVE NUMBER:";
      DN
910 DN = INT (DN)
920 IF DN < 1 OR DN > 2 THEN 900
930 PRINT CHR$ (4)"CATALOG ,S";
      SL;","D";DN

```

```

940 INPUT "INPUT FILE NAME:";UI$
950 PRINT CHR$ (4)"VERIFY ";UI$
960 HGR2 : PRINT CHR$ (4)"BLOAD
      ";UI$
970 FOR R = 1 TO 3000: NEXT R
980 TEXT : INPUT "IS THIS THE RI
      GHT FILE?";QW$
990 IF QW$ < > "Y" THEN 940
1000 OPO = 999
1010 GOTO 20
1020 PRINT CHR$ (7);"ERROR IN L
      OAD FUNCTION.": FOR R = 1 TO
      1000: NEXT
1030 GOTO 870
1040 PRINT CHR$ (7);"ERROR IN S
      AVE FUNCTION.": FOR R = 1 TO
      1000: NEXT
1050 GOTO 720
1060 REM

```

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Checksums for Three-D Wall Draw

Configuration 1

10 - \$62B3	280 - \$519C	550 - \$31D9	820 - \$DDF4	950 - \$F93B
20 - \$310E	290 - \$BC32	560 - \$0A0E	830 - \$1A4C	960 - \$877C
30 - \$2E10	300 - \$23E1	570 - \$AF28	840 - \$270B	970 - \$AAF5
40 - \$5505	310 - \$8EA6	580 - \$2C19	850 - \$A51A	980 - \$6446
50 - \$94BD	320 - \$FC26	590 - \$9C80	860 - \$53AB	990 - \$AC00
60 - \$E04C	330 - \$41FA	600 - \$4B02	870 - \$3C95	1000 - \$D9A4
70 - \$057A	340 - \$7150	610 - \$8C8A	880 - \$1DD4	1010 - \$C924
80 - \$764D	350 - \$C003	620 - \$140C	890 - \$B853	1020 - \$9278
90 - \$E959	360 - \$C641	630 - \$F123	900 - \$4DA1	1030 - \$89DE
100 - \$1231	370 - \$1E4B	640 - \$C618	910 - \$98B6	1040 - \$4AEE
110 - \$64D9	380 - \$0780	650 - \$DF60	920 - \$5D45	1050 - \$6600
120 - \$EDC2	390 - \$B5BC	660 - \$081A	930 - \$1B7D	1060 - \$1879
130 - \$73CB	400 - \$2B1A	670 - \$1AC3	940 - \$A9CC	
140 - \$335B		680 - \$0BAA		
150 - \$35D8	410 - \$BF70	690 - \$7F92		
160 - \$BC40	420 - \$726E	700 - \$57C3		
170 - \$E1E0	430 - \$82F4	710 - \$6A0F		
180 - \$BD31	440 - \$552F	720 - \$95BC		
190 - \$F64A	450 - \$A2D6	730 - \$B11E		
200 - \$A9A8	460 - \$9524	740 - \$91C1		
	470 - \$C791	750 - \$B6A9		
210 - \$2096	480 - \$CBBA	760 - \$4CC2		
220 - \$8A58	490 - \$4449	770 - \$30B8		
230 - \$2ABD	500 - \$4D24	780 - \$8687		
240 - \$41EE	510 - \$4842	790 - \$3168		
250 - \$7851	520 - \$B79C	800 - \$AA97		
260 - \$E9F6	530 - \$3711			
270 - \$224B	540 - \$966C			
		810 - \$FF06		

For information on SoftKey's Checksums, see the Table of Contents.

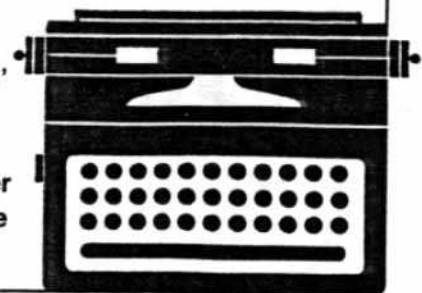
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CHECKSUMS FOR CORE



UFO Factory Configuration 1

0	- \$920C	1130	- \$5FB5	1810	- \$E774
1	- \$0B99	1150	- \$5B4D	1850	- \$19FF
2	- \$9F59	1160	- \$590C	1860	- \$9EE5
10	- \$6208	1199	- \$3171	1890	- \$C34A
49	- \$A7C9	1200	- \$6663	1900	- \$47F2
50	- \$9670	1250	- \$7684	1999	- \$8090
99	- \$3F00	1300	- \$4F08	2000	- \$4E94
100	- \$8908	1350	- \$80AC	2010	- \$091D
110	- \$A904	1400	- \$83C2	2090	- \$9FDB
120	- \$EDEF	1500	- \$86C4	2099	- \$24FB
130	- \$C919	1510	- \$4FAB	2100	- \$49A3
140	- \$84D9	1520	- \$0589	2200	- \$6D76
999	- \$35B1	1540	- \$98DE	2300	- \$FA1C
1000	- \$01F7	1600	- \$4EB2	2400	- \$83A0
1010	- \$83F9	1800	- \$395A	2500	- \$8C4E
1020	- \$EB98				
1100	- \$E8EC				
1110	- \$019A				
1120	- \$44D5				

Demo Configuration 1

10	- \$A305	120	- \$A9B7	220	- \$A450	300	- \$1123
20	- \$F92E	130	- \$4450	230	- \$84E8	340	- \$A97C
30	- \$94A8	140	- \$FF24	240	- \$EC9A	350	- \$80BE
40	- \$5A35	150	- \$46F5	250	- \$8BE8	360	- \$71A0
50	- \$7A36	160	- \$A8BB	260	- \$5ED5	370	- \$8EA7
60	- \$0F14	170	- \$88B2	270	- \$7D4F	380	- \$58A4
70	- \$ACB4	180	- \$1F1E	280	- \$184C	390	- \$444C
80	- \$AFFB	190	- \$A79A	290	- \$9FBE	400	- \$AC5E
90	- \$6DA2	200	- \$F4B4	300	- \$F343	410	- \$1171
100	- \$60BE			310	- \$944D	420	- \$85B6
110	- \$426C	210	- \$3E58	320	- \$4EC6		

Design Plus

Configuration 1

10	- \$468F	330	- \$E32C
20	- \$61BB	340	- \$646D
30	- \$62E6	350	- \$583E
40	- \$7CBB	360	- \$83A6
50	- \$4016	370	- \$88EF
60	- \$8CD3	380	- \$9D43
70	- \$20BE	390	- \$A059
80	- \$B48D	400	- \$CAB0
90	- \$89A0		
100	- \$86C1	410	- \$75AC
110	- \$FF2E	420	- \$9C3F
120	- \$8C08	430	- \$F15B
130	- \$FD36	440	- \$E773
140	- \$D007	450	- \$3838
150	- \$3108	460	- \$88D6
160	- \$1CDD	470	- \$25D2
170	- \$530E	480	- \$C634
180	- \$4A0C	490	- \$7EA0
190	- \$1F7D	500	- \$7ED7
200	- \$93FD	510	- \$3373
		520	- \$8D00
210	- \$6680	530	- \$4A07
220	- \$D7FD	540	- \$1ED0
230	- \$F24B	550	- \$4F42
240	- \$866C	560	- \$8D7B
250	- \$6D6C	570	- \$A0FD
260	- \$1752	580	- \$7E6A
270	- \$81A1	590	- \$8D32
280	- \$78D0	600	- \$CFC0
290	- \$2BA2		
300	- \$E076	610	- \$E2AE
310	- \$C5A2	620	- \$0103
320	- \$789F	630	- \$680F

Pack

BEG: 803 END: 906

0003-	A9 FF 8D 09 09	.....	\$A21F	00D0-	00 C0 04 90 18 A5 FE 20	.....	\$911F
0008-	A9 00 8D 07 09 05 FE A9	.....	\$82D7	00D8-	FB 08 98 20 FB 08 A5 03	.....	\$EA2F
0010-	00 8D 08 09 8D 1D 08 A9	.....	\$D46A	00E0-	20 FB 08 A9 00 05 00 68	.....	\$8F68
0018-	20 8D 1E 08 AD FF FF CD	.....	\$85C9	00E8-	A4 04 05 03 60 A5 03 C5	.....	\$1DFF
0020-	07 09 D0 05 EE 08 09 F0	.....	\$A301	00F0-	FE F0 E2 20 FB 08 08 D0	.....	\$86BC
0028-	29 EE 1D 08 D0 EE EE 1E	.....	\$86D0	00F8-	FA F0 E8 8D FF FF EE FC	.....	\$87B6
0030-	00 AD 1E 08 C9 40 D0 E4	.....	\$D4C9	0900-	08 D0 03 EE FD 08 60	.....	\$D396
0038-	AD 08 09 D0 08 AD 07 09	.....	\$71F6				
0040-	05 FE 4C 59 08 CD 09 09	.....	\$8681				
0048-	00 08 8D 09 09 AD 07 09	.....	\$FABA				
0050-	05 FE CE 07 09 D0 08 A5	.....	\$899A	0300-	A2 00 A0 40 8C 30 03 A0	.....	\$C868
0058-	FE 8D 00 40 A2 00 06 00	.....	\$CD90	0308-	00 8C 2F 03 20 2E 03 05	.....	\$9002
0060-	06 01 A0 40 8C FD 08 A0	.....	\$D05E	0310-	FE 20 2E 03 C5 FE F0 05	.....	\$E805
0068-	00 8C A2 08 A9 01 8D FC	.....	\$801A	0318-	20 3A 03 90 F4 20 2E 03	.....	\$6168
0070-	00 A9 20 8D A3 08 98 48	.....	\$F53F	0320-	05 00 20 2E 03 20 3A 03	.....	\$7A44
0078-	29 C0 8D A2 08 4A 4A 0D	.....	\$773F	0328-	C6 00 D0 F9 F0 E3 AD FF	.....	\$2A85
0080-	A2 08 8D A2 08 68 8D A3	.....	\$4B0F	0330-	FF EE 2F 03 D0 03 EE 30	.....	\$49C4
0088-	08 0A 0A 0A 2E A3 08 0A	.....	\$68E3	0338-	03 60 48 98 48 29 C0 8D	.....	\$EB71
0090-	2E A3 08 0A 6E A2 08 AD	.....	\$5A8A	0340-	68 03 4A 4A 0D 68 03 8D	.....	\$CECD
0098-	A3 08 29 1F 09 20 8D A3	.....	\$45E0	0348-	68 03 68 8D 69 03 0A 0A	.....	\$1C5D
00A0-	00 8D FF FF 24 01 30 08	.....	\$29AA	0350-	0A 2E 69 03 0A 2E 69 03	.....	\$8401
00A8-	05 03 A9 80 05 01 30 07	.....	\$E471	0358-	0A 6E 68 03 AD 69 03 29	.....	\$4FE7
00B0-	C5 03 F0 03 20 CC 08 E6	.....	\$EAEB	0360-	1F 09 20 8D 69 03 68 9D	.....	\$80F2
00B8-	00 C8 C0 C0 90 B8 20 CC	.....	\$7EB5	0368-	FF FF C8 C0 C0 90 07 A0	.....	\$7779
00C0-	00 EB E0 28 F0 26 A0 00	.....	\$924A	0370-	00 E8 E0 28 B0 01 60 68	.....	\$8A6F
00C8-	04 01 F0 AA 48 04 04 A4	.....	\$39D5	0378-	68 60	.....	\$88C3

Un-pack BEG: 300 END: 379

Orde.Space Raid.Ch

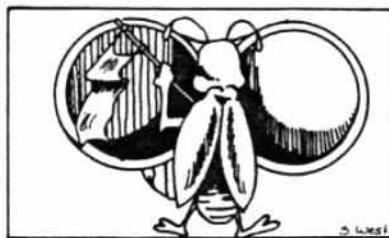
BEG: 1300 END: 14FF

1300- 00 00 00 00 00 00 00 00 : \$00E3	1340- 00 00 00 00 00 00 00 00 : \$2676	1380- 0E 0C 0C 0C 0C 0C 0C 0E 1E : \$FD46
1300- 0C 0C 0C 0C 0C 0C 0C 0C : \$A07D	1350- 1C 3E 68 7F 68 3E 1C 00 : \$038F	1390- 1E 31 30 10 0E 03 03 3F : \$05A7
1310- 00 00 00 00 00 00 00 00 : \$20ED	1350- 00 08 1C 36 1C 00 00 00 : \$6D84	1390- 1E 31 30 1C 30 30 31 1E : \$33CD
1318- 00 22 1C 14 1C 22 00 00 : \$4447	1360- 00 00 00 00 00 00 00 00 : \$FDC4	13A0- 19 19 19 3F 18 18 18 18 : \$C33C
1320- 00 00 00 00 00 00 00 00 : \$84F7	1360- 00 00 00 3F 3F 00 00 00 : \$3D62	13A0- 3F 03 03 1F 30 30 31 1E : \$89A4
1320- 00 00 00 00 00 00 00 00 : \$4447	1370- 00 00 00 00 00 00 00 00 : \$AD42	1380- 1E 23 03 1F 23 23 23 1E : \$A68D
1330- 28 11 04 10 44 09 20 02 : \$CE96	1370- E3 F7 FF 05 05 9C 00 00 : \$6F10	1380- 3F 31 30 18 0C 0C 0C 0C : \$649E
1330- 18 10 00 00 00 00 00 00 : \$2676	1380- 1E 23 27 28 33 23 23 1E : \$CE8F	13C0- 1E 23 23 1E 23 23 23 1E : \$DE3F
1340- 00 00 00 00 00 00 00 00 : \$C696		13C0- 1E 31 31 3E 30 30 31 1E : \$6805

Space Raid

Configuration 1

10 - \$09A3	390 - \$125D	760 - \$50DC	1040- \$8200	1330 - \$0609
20 - \$0500	400 - \$70BC	770 - \$4B0B	1050- \$80FA	1340 - \$8F8C
30 - \$1284		780 - \$E7DB	1060- \$10FF	1350 - \$E5A9
40 - \$C038	410 - \$5FB2	790 - \$EBFF	1070- \$7760	1360 - \$0F77
50 - \$284E	420 - \$4169	800 - \$6E33	1080- \$80DA	1370 - \$EDE5
60 - \$744B	430 - \$00A6		1090- \$2802	1380 - \$3385
70 - \$80D9	440 - \$6EB8	810 - \$4093	1100- \$5AE0	1390 - \$E49D
80 - \$27DA	450 - \$09AD	820 - \$8ACE	1110- \$389D	1400- \$935E
90 - \$E6C7	460 - \$1876	830 - \$8784	1120- \$15CF	
100 - \$C9D3	470 - \$8688	840 - \$39FD	1130- \$1376	1410 - \$8338
110 - \$8093	480 - \$FB71	850 - \$1BEC	1140- \$823E	1420 - \$497C
120 - \$657A	490 - \$E809	860 - \$41E3	1150- \$8D65	1430 - \$262E
130 - \$A325	500 - \$C038	870 - \$4AA6	1160- \$017A	1440 - \$EA7E
140 - \$80CD	510 - \$91E3	880 - \$8F58	1170- \$7D82	1450 - \$88D2
150 - \$66A1	520 - \$78DC	890 - \$1296	1180- \$F831	1460 - \$472E
160 - \$748A	530 - \$C54F	900 - \$DCD7	1190- \$89D0	1470 - \$86DF
170 - \$1868	540 - \$1276	910 - \$E683	1200- \$A369	1480 - \$8A09
180 - \$4EB8	550 - \$1132	920 - \$6ADE		1490 - \$8F21
190 - \$6DFA	560 - \$A478	930 - \$8000	1210 - \$938F	1500- \$11E4
200 - \$11F6	570 - \$E776	940 - \$A7D9	1220- \$6AB6	1510 - \$EC67
	580 - \$DD16	950 - \$E864	1230- \$C58E	1520 - \$E1D6
210 - \$5CAD	590 - \$4788	960 - \$6DBF	1240- \$E3D9	1530 - \$79FA
220 - \$EE16	600 - \$F946	970 - \$868C	1250- \$3F5C	1540 - \$3D6C
230 - \$F8C6		980 - \$E96E	1260- \$34CA	1550 - \$887A
240 - \$C7BD	610 - \$A98F	990 - \$75E4	1270- \$2D83	1560 - \$94C1
250 - \$9C95	620 - \$5831	1000- \$6FE9	1280- \$7678	1570 - \$50CC
260 - \$4CBA	630 - \$EDBF		1290- \$E8E3	1580 - \$7119
270 - \$8CD7	640 - \$982A	1010- \$C83D	1300- \$D7C4	1590 - \$982F
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290 - \$413C	660 - \$A14C	1030- \$553A	1320 - \$AB58	
300 - \$82F8	670 - \$8B15			14E0- 00 00 00 00 00 00 00 00 : \$783C
310 - \$E1BA	680 - \$554F			14E0- 3F 30 30 30 30 30 3F : \$Dfce
320 - \$EA69	690 - \$3A11			14F0- 00 9C 05 05 FF F7 E3 00 : \$9320
330 - \$68D1	700 - \$C28D			14F0- 00 00 00 00 00 00 00 00 : \$6340
340 - \$3530	710 - \$38D8			
350 - \$E188	720 - \$88CC			
360 - \$E2D6	730 - \$6332			
370 - \$E6C3	740 - \$803C			
380 - \$6EF4	750 - \$4378			



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ASCII Set

continued from page 33

0FD0- 00 29 2D F8 1B 24 24 0C	\$3A2B
0FD8- 2D 15 05 00 2D E8 24 24	\$C574
0FE0- 24 2D AD 36 36 1E 3F 3F	\$1515
0FE8- 00 3F 48 2D 2D 3F 3F 24	\$579F
0FF0- 2C 2D 3F 27 24 2D 2D 05	\$18AA
0FF8- 00 3D 33 24 2C 2D 3F 27	\$9B15
1000- 24 2D 2D 05 00 05 08 29	\$259E
1008- 2D 20 2F F6 3F 07 20 24	\$A201
1010- 64 2D 15 06 00 B0 A2 24	\$DE73
1018- 24 24 36 2E 2D 25 24 36	\$F68E
1020- 36 36 06 00 2D 48 29 3D	\$7355
1028- 24 24 24 2F 2D 00 05 C0	\$36F0
1030- 20 76 2D 05 20 24 24 04	\$5D9C
1038- 00 24 A5 24 24 24 36 2E	\$CA0E
1040- 05 28 28 B0 DA 72 0E 05	\$F3C2
1048- 00 E4 84 24 24 24 36 36	\$2E69
1050- 36 2D 2D 05 00 2D F0 24	\$7898
1058- 24 24 15 15 05 60 36 36	\$E0A9
1060- 36 06 00 36 C0 24 24 24	\$D3A1
1068- 95 0E 0E 56 24 24 24 04	\$FCA2
1070- 00 F6 0B 29 2D 20 24 E4	\$2E09
1078- 3F 17 36 36 06 00 07 29	\$96CB
1080- 64 24 24 24 2D AD F6 3F	\$8947
1088- 3F 00 37 2A 85 20 24 64	\$69A7
1090- 2D 15 36 36 3E 3F 2D E4	\$E599
1098- 07 00 28 06 00 24 24 24	\$DAE3
10A0- 2D AD F6 3F 0E 0E 0E 05	\$D0F4
10A8- 00 27 04 A8 A8 2D 05 20	\$528C
10B0- 1C 3F 07 20 0C 2D 15 05	\$5209
10B8- 00 3C A4 F6 09 24 24 24	\$AA2D
10C0- 3F 2D 2D 2D 00 00 13 64	\$FC46
10C8- 20 24 24 36 36 76 2D 05	\$9E97
10D0- 20 24 24 04 00 2D 60 0C	\$D1F1
10D8- 09 1C 1C 24 24 4D 31 36	\$CCBE
10E0- F6 06 00 27 90 24 24 24	\$D2E6
10E8- 24 36 36 2D A8 35 26 24	\$38F9
10F0- 24 24 00 05 85 3F 64 0C	\$B2AF
10F8- 1C 1C 6C 09 F6 16 0E 36	\$E5EB
1100- 00 3F 03 55 09 24 E4 1C	\$BC9E
1108- 64 49 32 1E 06 00 2D 03	\$F85D
1110- 55 2D 2D 3F 3F 64 0C 0C	\$2527
1118- 0C 3C 3F 3F 00 47 48 45	\$79FE
1120- 52 20 55 49 3F 27 24 24	\$DDE5
1128- 2C 2D 07 00 0C 49 01 E0	\$0225
1130- 1C 1C 1C 04 00 22 29 2D	\$85C7
1138- 24 24 24 3F 2F 00 0C C1	\$326B
1140- 60 0C 8C 72 06 00 55 2D	\$44A7
1148- 2D 2D 2D 2D 3D 3F 3F 3F	\$A3F9
1150- 3F 3F 3F 00 2D 2D 2D 20	\$5F7A

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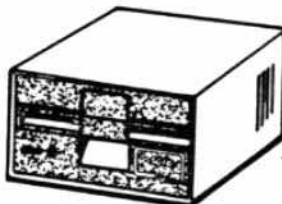
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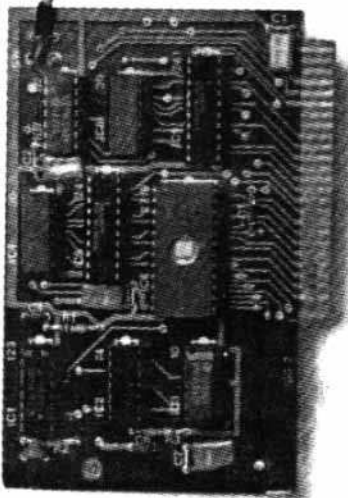
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