

MICRO

THE 6502 JOURNAL



No. 25

JUNE 1980

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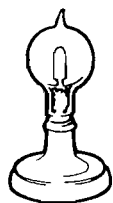
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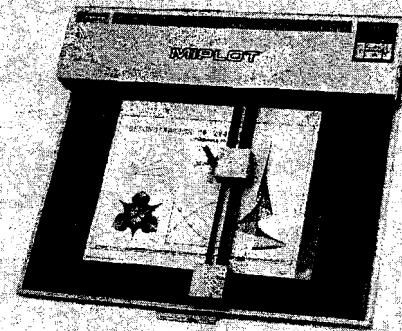
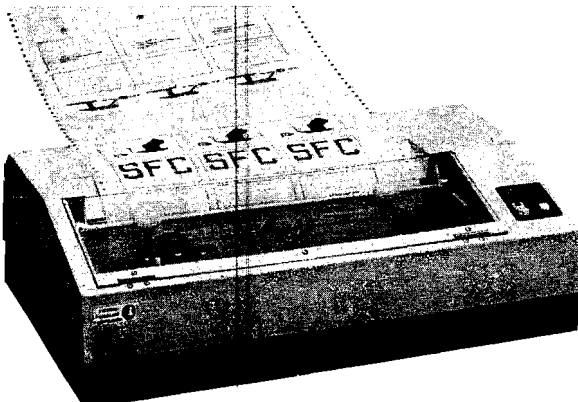
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June 1980

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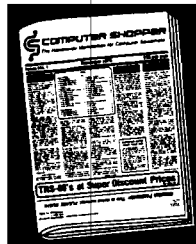
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MICRO through the Ages

Since this issue marks the beginning of Volume 4 of **MICRO**, I thought it might be a good time to review the history of the magazine for any readers who might be interested.

MICRO was first published in October 1977. The purpose of the journal was two-fold: to promote the 6502 microprocessor and to provide an economical advertising medium for the 6502 world. In 1977, the 6502 was getting very little coverage in the major computer publications. An entire issue of **BYTE** or **Kilobaud** might contain, if you were lucky, one article relating to the 6502! As a KIM-1 enthusiast, I felt that this was unfair. I had started making products to support the KIM in November 1976 on a full-time basis. By late summer 1977 I had a couple of software packages, a power supply, and was in the advanced stages of development on a memory expansion board. I could see a problem arising: How to advertise these products. I could not afford to run ads in the national general purpose magazines for two reasons: first, the absolute cost was prohibitive; and, second, only a small percentage of the total readership would be interested in these KIM related products - making the cost of reaching potential customers very high. Thinking about these two problems, I decided the best remedy would be a high quality

6502 based journal which could serve to promote the 6502 in general, and to serve the 6502 based companies as an economical advertising medium. My initial expectation was that I could include my own ads and break even on the publication, that would be doing okay. Our first issue was 28 pages long, printed at a 'store-front' print shop, and distributed to 450 subscribers and dealers shop, and 450 copies were distributed to subscribers and dealers. It was a start.

By October 1978, **MICRO** had grown in size, quality, and circulation. And, to my surprise, profitable! We were running about 52 pages, had changed printers twice as we outgrew them, and our readership was about 3000. The magazine was still published bi-monthly.

In February 1979, **MICRO** went monthly. This provided quicker turnaround for advertisers, and also increased the amount of material we could print. In May 1979, a separate corporation was formed for the purpose of publishing **MICRO** and other 6502 related material. Until this time, the magazine had been published by **The Computerist, Inc.**, my company which had continued to develop products for the KIM, and now the AIM and SYM as well. We felt that **MICRO** was conceptually and functionally a separate entity, with its own staff and equipment. **MICRO INK, Inc.**, was incor-

porated in May 1979. By this time we had outgrown another printer and moved on to **Wallasley Press Inc.**, and the format we have today - high quality printing on glossy stock. We also acquired our own typesetting equipment during the summer. The circulation was about 6000 and each issue was 52 pages or more.

The changes in **MICRO** in the past year have been more evolutionary than revolutionary. It has expanded in size to 84 pages per issue, doubled in circulation to over 12,000, added new features, and now, with this issue, goes to full color covers. This was done primarily to allow those advertisers who will only advertise in color, to advertise with us. Secondly, we hope that the colorful cover will be attractive both to our subscribers and those who purchase **MICRO** at their local computer store. We have ordered an option for our typesetter which will, in the near future, allow listings to be generated on any one of our microcomputers, and then sent directly to the typesetter. This will improve the quality and accuracy of the listings.

We would like to thank all of you who have helped **MICRO** grow and prosper, especially those of you who have written the articles which form the backbone of the publication. We look forward to an exciting new year serving the 6502 world.

MICRO

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MICRO in the Kitchen

Cover Artist
Terry Spillane

The Compleat Menu Planner

This month's cover depicts one of the ways in which the microcomputer may eventually aid the average family in planning menus in a systematic, dietically correct manner. I remember reading about this concept at least ten years ago, way back when the idea of a computer in the home was mind-boggling.

The Menu Planner assists the menu selection in several ways:

First, it helps to select each meal. As the user selects each item from a displayed list, new, related lists are presented. For example, the initial selection of **MEAT** would result in a list of various types of meat. A selection of **CHICKEN** would cause a list of major ways to prepare chicken to appear: bake, broil, stew, etc. The entire, appetizing meal would quickly evolve.

Second, the program would calculate the overall food value of the meal. It would have a list of the dietary requirements of the various members of the family, and would determine if these requirements were being met. It could make suggestions for changing particular items which were causing a dietary imbalance. The user could, presumably, override any such suggestions!

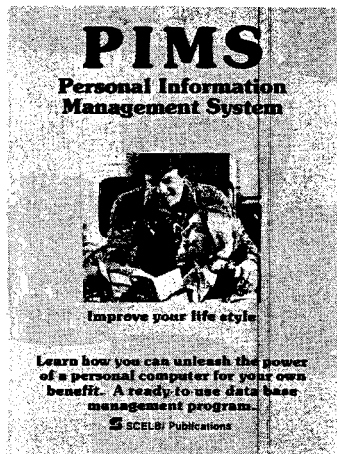
Third, as the meals for a period of time were determined, a shopping list could be generated which would take into account the meals for the week and the inventory on-hand.

Fourth, provided with a list of current prices for the items at the local supermarkets, it could determine where the individual products should be purchased, even taking into account the cost of getting to each store and personal preferences of the user.

Fifth, when it comes time to prepare a particular meal, the recipes and other instructions are displayed. Cooking times are measured automatically, and, if desired, sensors are connected to measure the internal temperature of the meat, or whatever.

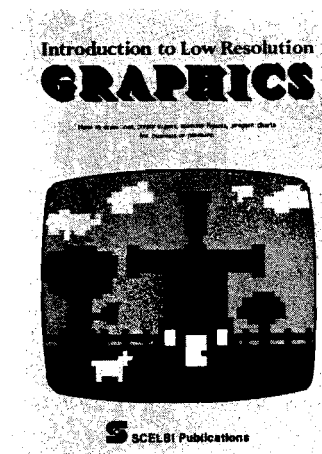
The capabilities are here now. Where are the programs? A rather inexpensive system should be able to perform all of the above functions, and earn its keep very quickly. If it could save \$10 per week by finding the best buys, calculating correct amounts to purchase without waste, and keeping an eye on the inventory to prevent spoilage, that would be \$500 per year!

SERIOUS READING



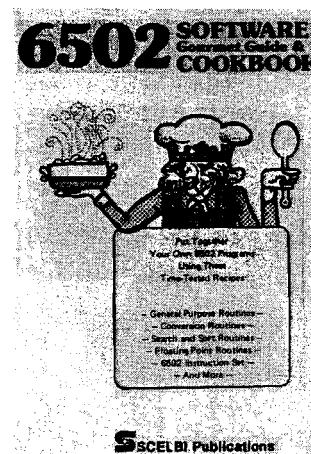
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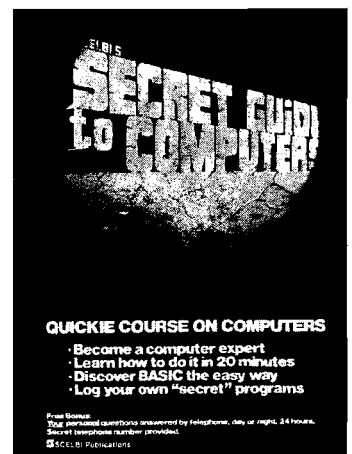
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A Little Plus for Your APPLE II

For those of you who own an Apple II and are envious of the newer Apple II Plus, EDITPLUS provides you with some of the new features, at no cost!

Craig Peterson

A while back, Apple Computer, Inc., came out with a new version of their Apple II computer called the Apple II Plus. In this new machine comes the now famous Auto-Start ROM, and one of its neat features is a very much improved editing capability. In particular, for the standard Apple II owner, the 'non-copy' movement of the cursor requires two keystrokes for each column or row moved. (e.g. 'ESC', 'D', 'ESC', 'D', etc., etc.) Very tedious, and sometimes it is a bit unreliable.

On an Apple II Plus you just press 'ESC' and then use the I, J, K, or M key for cursor control up, left, right, and down respectively. And for really great action, you can use the repeat key along with the IJKM to speed the cursor 'non-copying' to any position on the screen. To get out of this editing mode, you just press any key other than the I, J, K or M key. This last key will be handled like a normal escape function and then you will be out of the special editor. Really nice, huh?

A second feature of the Apple II Plus is the ability to stop program listings. By pressing 'CTRL' 'S' during a listing, that blur of characters will be stopped so you can read the program. Pressing any key will begin the listing again right where it stopped. This works in both Integer Basic and Applesoft. It even works in the Monitor to stop a trace if you wish. In Applesoft, if the second key pressed is a 'CTRL' 'C', the listing will be aborted — just as you would expect normally.

Well, if you would like to be able to do this on your standard Apple II, you can either purchase the Auto-Start ROM, which has this and other features, for \$65, or you can use the EDITPLUS program.

The EDITPLUS program is not very large and the way it works is fairly simple. Typing 'Call 768' revises the input and output hooks so that any I/O will be sent through EDITPLUS. The editing portion of the program, though the input hook, just looks for an 'ESC' character. If found, the program then checks the next character to see if it is an I, J, K, or M. If it is, the proper cursor action is performed and the next character is checked to see if it is an I, J, K, or M, and so on. The first non-IJKM character causes the program to do a normal escape function and then exit this mode. To totally disengage from this feature of EDITPLUS, just type 'IN#0', which restores the normal input hook address.

The control S feature of EDITPLUS uses the output hook. During any output, the program checks the keyboard strobe and if a 'CTRL' 'S' has been pressed, the output is stopped after the next carriage return. The EDITPLUS waits until a key is pressed again and at that time the output continues. If the second key is a 'CTRL' 'C', the keyboard strobe is left on so that Applesoft will see the 'CTRL' 'C' and abort the listing. To totally disengage from this feature of EDITPLUS, just type 'PR#0', which restores the normal output hook address.

An additional feature which I've added to all of this is escape L. By typing 'ESC' 'L', you leave whatever Basic you are in and jump to the Monitor, which is much quicker and easier than typing Call-151 all the time.

The assembly program listing for EDITPLUS is fairly self-explanatory.

The assembly program listing for EDITPLUS is fairly self-explanatory. This example is assembled at good old page 3, hex address \$300, but it could be anywhere you want. Also, this example is set up for use with 3.2 DOS on a 48K system. If you have 3.1 DOS and 48K memory, use DOS addresses \$A7AD and \$A99E in place of \$A851 and \$AA5B in lines 200, 210, 400, 640, and 690. If you have less than 48K, adjust these addresses downward a commensurate amount. Also, 3.1 DOS is peculiar in that it won't allow you to BRUN EDITPLUS right off the disk. You must BLOAD it, and then Call 768. If you don't have a disk system, simply change line 400 to RTS and delete lines 640, 680, and 690. If this change is made, it will be necessary to reassemble the program, or pad the revised lines with NOPs (\$EA), because the branch addresses will change.

So there you have it. A nice edit program for your Apple II. No longer do you need to be jealous of those folks that have an Apple II Plus. You too can have fun editing (and TRACE and STEP too, heh! heh!).

μ

Craig Peterson is an engineer who has owned an Apple II since May of 1979. Since then, he has enjoyed working with it to such an extent, that he recently persuaded his employer to buy one to aid in programming numerical control routing machines.

```

0010 :*****
0020 :*          EDITPLUS          *
0030 :*          BY                *
0040 :*          CRAIG PETERSON    *
0050 :*          DECEMBER 1979    *
0060 :*                               *
0070 :*A PROGRAM TO GIVE THE STANDARD*
0080 :* APPLE II THE ENHANCED CURSOR *
0090 :* EDITING CAPABILITIES OF THE *
0100 :*          APPLE II PLUS    *
0110 :*****
0120 :
0130 CH      .DL 0024
0140 BASL .DL 0028
0150 YSAV .DL 0035
0160 CSWL .DL 0036
0170 CSWH .DL 0037
0180 KSWL .DL 0038
0190 KSWH .DL 0039
0200 DOS .DL A851
0210 YDOS .DL AA5B
0220 KBRD .DL C000
0230 STRB .DL C010
0240 ESC1 .DL FC2C
0250 RKEY .DL FD0C
0260 OUT1 .DL FDF0
0270 KEYN .DL FD1B
0280 MNTR .DL FF65
0290 :
0300          .OR 0300
0310 :
0300 AD7E03 0320 BGIN LDA KADR      CHANGE INPUT &
0303 8538    0330 STA *KSWL      OUTPUT POINTRS
0305 AD7F03 0340 LDA KADR+01    TO NEW ROUTINE
0308 8539    0350 STA *KSWH      AT 'SKEY' AND
030A AD8003 0360 LDA VADR        'SVID' RESP.
030D 8536    0370 STA *CSWL
030F AD8103 0380 LDA VADR+01
0312 8537    0390 STA *CSWH
0314 4C51A8 0400 JMP DOS        CHG DOSPTRS&RTN
0317 201BFD 0410 SKEY JSR KEYN   GET NEXT CHAR
031A C99B    0420 CMP 9B        IS CHAR='ESC'?
031C F00B    0430 BEQ ESC2      IF SO, GO ESC2
031E 60       0440 RTS          IF NOT, RETURN
031F 38       0450 SPCL SEC      PREPARE A PTR &
0320 E9C9     0460 SBC 0C9       TURN I,J,K,M
0322 AB       0470 TAY          INTO D,B,A,C
0323 B97903   0480 LDA TABL,Y    RESPECTIVELY
0326 202CFC   0490 JSR ESC1     DO STANDARD ESC
0329 A424     0500 ESC2 LDY *CH    GET THE NEXT
032B B128     0510 LDA (BASL),Y  INPUT CHARACTP
032D 4B       0520 PHA
032E 293F     0530 AND 3F
0330 0940     0540 ORA 40
0332 9128     0550 STA (BASL),Y
0334 6B       0560 PLA
0335 201BFD   0570 JSR KEYN
0338 C9CE     0580 CMP 0CE        IS CHAR>='N'?
033A B00E     0590 BCS RTRN      THEN RETURN
033C C9C9     0600 CMP 0C9        IS CHAR<'I'?
033E 900A     0610 BCC RTRN      THEN RETURN
0340 C9CC     0620 CMP 0CC        IS CHAR='L'?
0342 D0DB     0630 BNE SPCL      IF<'L',DO SPCL

```

0344	2051A8	0640		JSR DOS	IF=L, RESET DOS
0347	4C65FF	0650		JMP MNTR	PNTRS & ->MNTR
034A	38	0660	RTRN	SEC	ITS NOT I,J,K,M
034B	202CFC	0670		JSR ESC1	SO DO STD ESC
034E	A424	0680		LDY *CH	CORRECT YSAVE
0350	8C5BAA	0690		STY YDOS	REG IN DOS
0353	4C0CFD	0700		JMP RKEY	AND RETURN
0356	8435	0710	SVID	STY *YSAV	SAVE Y
0358	C98D	0720		CMP 8D	IS CHAR = CR?
035A	D018	0730		BNE RETN	IF NOT, RETURN
035C	AC00C0	0740		LDY KBRD	GET KBRD CHAR
035F	1013	0750		BPL RETN	NO STROB, RETRN
0361	C093	0760		CPY 93	IS IT CTRL 'S'?
0363	D00F	0770		BNE RETN	IF NOT, RETURN
0365	2C10C0	0780		BIT STRB	CLEAR KEY STROB
0368	AC00C0	0790	AGIN	LDY KBRD	IS KEY PRESSED?
036B	10FB	0800		BPL AGIN	IF NOT, TRY AGN
036D	C083	0810		CPY 83	IS IT CTRL 'C'?
036F	F003	0820		BEQ RETN	IF SO, LEAV STRB
0371	2C10C0	0830		BIT STRB	CLEAR KEY STROB
0374	A435	0840	RETN	LDY *YSAV	RESTORE Y &
0376	4CF0FD	0850		JMP OUT1	REJOIN OUTPUT
0379	C4C2C1	0860	TABL	.HS C4C2C1FFC3	
037C	FFC3				
037E	1703	0870	KADR	.SA SKEY	STOR 'SKEY' ADR
0380	5603	0880	VADR	.SA SVID	STOR 'SVID' ADR
		0890		.EN	

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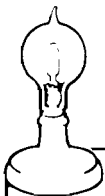
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Text Editor

To help you write your program, MacroTeA includes a powerful text editor with 34 command functions:

AUTO	Numbers lines automatically.
NUMBER	Automatically rennumbers lines.
FORMAT	Outputs text file in easy-to-read columns.
COPY	Copies a line or group of lines to a new location.
MOVE	Moves a line or group of lines to a new location.
DELETE	Deletes a line or group of lines.
CLEAR	Clears the text file.
PRINT	Prints a line or group of lines to the PET screen.
PUT	Saves a line or group of lines of text on the tape (or disc).
GET	Loads a previously saved line or group of lines of text from the tape (or disc).
DUPLICATE	Copies text file modules from one tape recorder to the other. Stops on specific modules to allow changes before it is duplicated. This command makes an unlimited length program (text file) practical.
HARD	Prints out text file on printer.
ASSEMBLE	Assembles text file with or without a listing. Assembly may be specified for the object code (program) to be recorded or placed in RAM memory.
PASS	Does second pass of assembly. Another command that makes unlimited length text files (source code) practical.
RUN	Runs (executes) a previously assembled program.
SYMBOLS	Prints out the symbol table (label file).
SET	Gives complete control of the size and location of the text file (source file), label file (symbol table) and relocatable buffer.
DISK	Gives complete access to the eleven DOS commands: PUT GET NEW INITIALIZE DIRECTORY COPY DUPLICATE SCRATCH VALIDATE RENAME ERROR REPORT
EDIT	Offers unbelievably powerful search and replace capability. Many large computer assemblers lack this sophistication.
FIND	Searches text file for defined strings. Optionally prints them and counts them; i.e., this command counts number of characters in text file.
MANUSCRIPT	Eliminates line numbers on PRINT and HARD command. Makes MacroTeA a true and powerful Text Editor.
BREAK	Breaks to the Monitor portion of MacroTeA. A return to Text Editor without loss of text is possible.
USER	Improves or tailors MacroTeA's Text Editor to user's needs; "Do-it-yourself" command.

Fast...Fast Assembler

Briefly, the pseudo-ops are:

- **BA** Commands the assembler to begin placing assembled code where indicated.
- **CE** Commands the assembler to continue assembly unless certain serious errors occur. All errors are printed out.
- **LS** Commands the assembler to start listing source (text file) from this point on.
- **LC** Commands the assembler to stop list source (text file) from this point in the program.
- **CT** Commands the assembler to continue that source program (text file) on tape.
- **OS** Commands the assembler to store the object code in memory.
- **OC** Commands the assembler to not store object code in memory.
- **MC** Commands the assembler to store object code at location different from the location in which it is assembling object code.
- **SE** Commands the assembler to store an external address.
- **DS** Commands the assembler to set aside a block of storage.
- **BY** Commands the assembler to store data.
- **SI** Commands the assembler to store an internal address.
- **DE** Commands the assembler to calculate an external label expression.
- **DI** Commands the assembler to calculate an internal label expression.
- **EN** Informs the assembler that this is the end of the program.
- **EJ** Commands the assembler to eject to top of page on printer copy.
- **SET** A directive not a pseudo-op, directs the assemblers to redefine the value of a label.

Macro Assembler

The macro pseudo-ops include:

MD	This is a macro beginning instruction definition.
ME	This is end of a macro instruction definition.
EC	Do not output macro-generated code in source listing.
ES	Do output macro-generated code in source listing.

Conditional Assembler

The conditional assembly pseudo-ops are:

IEQ	If the label expression is equal to zero, assemble this block of source code (text file).
INE	If the label expression is not equal to zero, assemble this block of source code (text file).
IPL	If the label expression is positive, assemble this block of source code.
IMI	If the label expression is negative, assemble this block of source code.
***	This is the end of a block of source code.

Enhanced Monitor

... By having 16 powerful commands:

A	Automatic MacroTeA cold start from Monitor.
Z	Automatic MacroTeA warm start from Monitor.
F	Loads from tape object code program.
S	Saves to tape object code between locations specified.
D	Disassembles object code back to source listing.
M	Displays in memory object code starting at selected location. The normal PET screen edit may be used to change the object code.
R	Displays in register. Contents may be changed using PET screen edit capabilities.
H	Hunts memory for a particular group of object codes.
W	Allows you to walk through the program one step at a time.
B	Breakpoint to occur after specified number of passes past specified address.
Q	Start on specified address. Quit if STOP key or breakpoint occurs.
T	Transfers a program or part of a program from one memory area to another.
G	Go!! Runs machine language program starting at selected location.
X	Exits back to BASIC.
I	Display memory and decoded ASCII characters.
P	Pack (fill) memory with specified byte.

What are the other unique features of the MacroTeA?

- Labels up to 10 characters in length
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- Create executable object code in memory or store on tape
- Text editor may be used for composing letters, manuscripts, etc.
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- Powerful two-cassette duplicator function
- String search capability
- Macros may be nested 32 deep
- 25 Assembler pseudo-ops
- 5 Conditional assembler pseudo-ops
- 40 Error codes to pinpoint problems
- 16 Error codes related to Macros
- Warm-start button
- Enhanced monitor with 16 commands

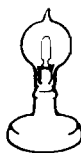
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Lower Case Lister

A 'bug' in the PET/CBM model 2022 and 2023 printers made before February 1980 causes listings to be printed as graphic symbols. This program provides a remedy.

Rev. James Strasma

One of the best features of the PET/CBM computers is their ability to easily use both upper and lower case letters. This same capability is included in the CBM model 2022 and 2023 printers. Unfortunately, printers made before February, 1980 cannot print in the lower and upper case mode unless a control character is sent at the start of EVERY line that needs lower case. This means that program printouts can be made to look very much like ordinary typed output. Listings, however, all come out in graphics mode. Graphics characters are substituted for all the upper-case characters in the listing, and all the lower-case characters come out in upper-case. (See the first sample Basic listing for an example of this.)

This leaves the programmer with three choices: 1) stick to graphics mode entirely, 2) learn to translate graphics into alpha, or 3) find a new way to list programs. I made the third choice, and lower-case lister is the result. It emulates the list routine in the CBM/PET Basic ROMs closely. Essentially, the routine prints the all-important (cursor down) character at the beginning of each line in the listing. This tells the printer to treat the rest of the line as lower-case. One other major change was necessary. At present, the PET printer errs in printing about 20 of the characters when in the lower-case mode. It replaces the correct character with the one having the opposite value in the high bit. This ups or cuts the character's value by 128. The correction involved screening each character before it is output, and flipping the high bit back again. One added consideration is that this is not to be done if the character involved is part of a Basic keyword. Those are output without

being screened. Note that the problem is in the printer, not the computer. Thus, if the 'fixed' characters are directed to the screen instead of a printer, they will be incorrect there. The result of the fix is that a listing made with the lower-case lister will look exactly like the same program would if listed normally in lower-case mode on the screen.

Because this is the sort of program I need all the time, I squeezed it into the second cassette buffer, an area safe not only from Basic, but even safe from hardware resets. Only a power failure disturbs that buffer. The lister is short enough not to interfere with the ROM monitor or the Basic Programmer's Tool kit, both of which use parts of the buffer. Two prices are paid for the choice location and compatibility. First, the only option is to list the entire program. Second, very long lines that extend onto a third line of the screen or second line of the printout when listed will revert to 'normal' faulty printing at the beginning of the extra line. Fixes for both of these are possible, but not in the space available.

For those of you with 'old ROMs', the program will need some changes. Nearly all the external references of the program (lines 190-290 in the assembler source) will have to be changed, along with the resulting object code. The changes for the assembler source code in the listing are given in Table 1. The object code changes are given in Table 2. With these changes, the program does work with the old ROM PETs.

Once you have typed in the correct code for your machine, making a lower-case listing is easy. The

commands are almost the same as usual:

open 4,4 to wake up the printer

print#4, a home character to set the paging mode

omd 4 to make the printer the output device

sys(826) instead of list to make the listing

print#4 to return command to the terminal

I'm told that eventually you will be able to buy a retrofit ROM to clean up lower-case listings automatically, at a cost of about \$40. Now it won't be necessary to wait or to pay that price. Which would you rather have, cryptic Basic listings like the first sample program here, or clean listings like the one below it? the choice is yours.

μ

James Strasma has been a United Methodist pastor for five years. He learned programming from books, and he has owned a PET for two years. He initially became interested in programming to do some work for the church.

Aside from his duties as a pastor, and the writing he does for Micro, Rev. Strasma also occupies his time organizing a users' group. This group is interested in C.W. Moser's assembler TED, in different 6502 versions.

Sample 1 (Bad)

```

100 REM> SAMPLE BASIC PROGRAM
110 REM> BEFORE LOWER-CASE LISTER
120 REM>
130 PRINT"-IRST, SOME /TT- -#-
140 PRINT"MIKED WITH LOWER CASE.
150 PRINT"IHEN SOME NUMBERS,
160 PRINT"LIKE 1,2,3,14, & SUCH,
170 PRINT"BOTH IN & OUT OF QUOTES
180 A=1:B=2:C=3,14
190 PRINT"WHEN SOME CURSOR-CONTROL
200 PRINT"CHARACTERS...
210 PRINT"VEN GRAPHICS, LIKE '
220 PRINT"-INALLY, THE ONES THAT
230 PRINT"THE -\ PRINTERS DON'T
240 PRINT"LIKE IN LOWER-CASE MODE:
250 PRINT"+ & +LEFT & UP ARROWS,
260 PRINT"[]=BRACKETS & \/=SLASHES,
270 PRINT"=TAB & !=ESCAPE.
280 PRINT"/UTE '↑' IN THE EQUATION
290 E=MC+2
300 END
READY.

```

Sample 2 (Good)

```

100 REM> sample basic program
110 REM> after lower-case lister
120 REM>
130 PRINT"First, some UPPER CASE
140 PRINT"mixed with lower case.
150 PRINT"Then some numbers,
160 PRINT"like 1,2,3,14, & such,
170 PRINT"both in & out of quotes
180 a=1:b=2:c=3,14
190 PRINT"Then some cursor-control
200 PRINT"characters...
210 PRINT"Even graphics, like '
220 PRINT"Finally, the ones that
230 PRINT"the CBM printers don't
240 PRINT"like in lower-case mode:
250 PRINT"+ & +left & up arrows,
260 PRINT"[]=brackets & \/=slashes,
270 PRINT"=tab & !=escape.
280 PRINT"Note '↑' in the equation
290 e=mc+2
300 end
READY.

```

Table 2 :Object Code Changes for Old ROM Pets

Change \$09 to \$60 at:
 \$0348
 037a
 037e
 039d

Change \$11 to \$08 at \$033d

Change \$12 to \$09 at \$033f

Change \$2c to \$22 at \$0341

Change \$45 to \$49 at:
 \$036a
 03ba
 03d3

Change \$46 to \$98 at:
 \$0363
 036f
 03a5

Change \$5c to \$ae at:
 \$034a
 0355
 0359
 0383
 0388
 038c
 038e
 0390

Change \$89 to \$8b at \$0394

Change \$d9 to \$9f at \$0365

Change \$e2 to \$d2 at \$0351

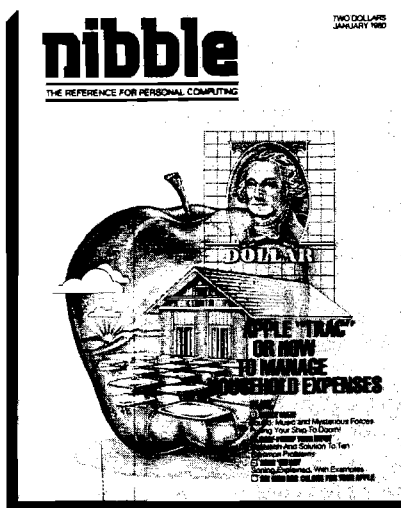
Table 1

SOURCE CHANGES FOR OLD ROM PETS

190	crlf	.de	\$c9d2	;Return+line feed
200	findlin	.de	\$c522	;Find ascii line
210	linstor	.de	\$08	;Stores line #
220	memory	.de	\$98	;Temporary storage
230	prchar	.de	\$ca49	;Prints a character
240	print	.de	\$dc9f	;Print integer value
250	quotflg	.de	\$60	;Flags quote mode
260	ready	.de	\$c38b	;Basic warm start
290	where	.de	\$ae	;Block transfer ptr. #2

270 toktab1 & 280 tstop remain unchanged

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Put Your Hooks Into OSI BASIC

Is it possible to extend your OSI BASIC-IN-ROM? Yes. In fact it is very easy, if you know how, and this article you will teach you how!

Edward H. Carlson

The OSI BASIC-IN-ROM has a remarkable feature which allows you to meddle with one of the innermost subroutines; the one that is used to parse a line of code character by character. It was intended to be tampered with, I am sure. Why else would the subroutine lie in page zero (\$BC to \$D3), copied there from its home in the BASIC ROM at \$BCEE? Listing 1 gives this "character parsing" routine.

This Microsoft BASIC, Version 1.0 Rev. 3.2, is used on all non-disk Ohio Scientific machines. I expect that a similar routine lies in page zero of the other 6502 Microsoft BASICs, such as the one for PET, and has been exploited by other hackers to make extensions of BASIC for their machines. In Listing 2, I show one way of doing this for use on my C2-4P and OSI C1 and C2 machines in general.

There are some subtle points which arose during this programming task, and the best way to explain them is to remind you of some of the "basic" facts about OSI BASIC. It operates in two modes, "immediate" and "RUN". In the immediate mode, you can enter a line of code, preceded or not by a line number. This code is entered into a buffer starting at \$13. When RETURN is hit, the first character of the line is picked up by the little parser which examines it to determine the fate of the line. If the line started with a numeral, then it is destined to be entered in the source code table. Otherwise it is executed

List 1

```
10 0000 : ***** CHARACTER PARSER *****
20 0000 :
30 000C * = $BC
100 00BC EBC3 P0 INC $C3 INCREMENT LO BYTE OF ADDRESS
110 00BE D002 BNE P1
120 00C0 EBC4 INC $C4 INCREMENT HI
130 00C2 ADFFFF P1 LDA $FFFF LOAD A WITH CHARACTER
140 00C5 C93A CMP #' : IS IT A COLON?
150 00C7 B00A BCS P2 IF YES, BRANCH AND START NEW LINE
154 00C9 C920 CMP #' IS IT A SPACE?
156 00CB F0EF BEQ P0 IF YES, GET ANOTHER CHAR.
160 00CD 38 SEC SET CARRY FLAG
170 00CE E930 SBC #$30 SUBTRACT $30
180 00D0 38 SEC SET CARRY FLAG
190 00D1 E9D0 SBC #$D0 SETS C FLAG FOR ASCII NUMERAL
200 00D3 60 P2 RTS END OF SUBROUTINE, CHAR. IN A
```

List 2

```
10 0000 : ***** HOOK TO OSI BASIC *****
15 0000 :
96 0000 : ***** INITIALIZATION ROUTINE *****
97 0000 :
98 0000 : STORE 6 BYTES IN ZERO PAGE TO JUMP TO THIS EXTENDED
99 0000 : BASIC ROUTINE
100 0000 :
102 0000 LO = $C3 LO BYTE OF CHAR. ADDRESS STORAGE
103 0000 SCREEN = $FE LO BYTE OF SCREEN ADDRESS STORAGE
105 0222 * = $0222
110 0222 A94C LDA #$4C
115 0224 85BC STA $BC
120 0226 A939 LDA $STARLO
125 0228 85BD STA $BD
130 022A A902 LDA $STARHI
135 022C 85BE STA $BE
140 022E A9EA LDA $SEA
142 0230 85BF STA $BF
143 0232 85C0 STA $C0
144 0234 85C1 STA $C1
150 0236 4C0000 JMP $0000 JUMP TO BASIC WARM START
190 0239 :
191 0239 : ***** MAIN ROUTINE *****
192 0239 :
193 0239 : CHECK THE BASIC SOURCE CODE LINE FOR THE CHARACTER
194 0239 : * OR %.
195 0239 :
200 0239 EBC3 START INC LO INCREMENT LO BYTE OF ADDRESS
202 023B STARHI = START+256
203 023B ZZZ = STARHI+256
204 023B STARLO = START-ZZZ
```

immediately *in situ*. Supposing the line starts with a numeral. The parser examines subsequent characters, transferring the numerals to another routine, until it finds a non-numeral character. Then the parser quits, handing the task of tokenizing the line and storing it in the source code table to another routine.

Our strategy is to splice into the character parser subroutine with a jump, so as to take a look at the current character before BASIC gets its hands on it. I picked two characters, % and #, not used by BASIC, to signal that we intend to message this line ourselves. We need two such labels because we first must safely transfer the line from the buffer to the source code table without triggering any special fireworks, yet on subsequent encounters with the line (during RUN) the spliced code in the parser must take special actions.

Listing 3 shows how our special line of code looks in a BASIC program. The line number is followed immediately by the # symbol, which is followed by a letter (or other symbol) and then by a null (not visible on the screen, but used in the source code table as a line terminator) or a colon (line continues with a new, independent statement of code). Now the sticker is that when inputting the line from the keyboard, we do not type "10#C" for example, but "10%C". When return is hit, the % sign triggers (at line 287 of listing 2) a replacement of % by # in the line of code in the buffer. Then the "tokenizer" moves the code, now reading "10#C", to its spot in the source code area of memory. When RUN is hit and execution reaches the # in the "10#C", our spliced code at line 282 branches to line 400 which calls the parser again. This is an example of reentrant coding since we were already in a (spliced in) section of the same subroutine! The extra call to the parser, which picks up the character after the #, means that BASIC outside our splice never sees the # symbol. This is essential because BASIC would have to fit over the # and would exclaim "syntax ERROR" and break. (I know. I got quite a few of them before I devised this somewhat cumbersome %, # trick.)

I show only one extension to BASIC, the rapid screen clear which is useful during games. The screen clear is signaled by the C after the #. One can put any number of CMP, BEQ pairs after line 420, one for each extension subroutine. I have a "rapid" tape read-write routine (three times as fast as OSI's) which I

intend to implement from BASIC. Other possibilities include a built in hex-to-decimal conversion so I can write "10#H Q=D000" instead of "10 Q=53248", which I find hard to remember.

Notice that the clear subroutine ends with a jump to the beginning of

List 2 continued

```

210 023B D002          BNE S1
220 023D E6C4          INC L0+1      INCREMENT HI
230 023F A5C3          S1 LDA $C3      STORE CHARACTER ADDRESS
240 0241 8D4A02        STA ADD+1
250 0244 A5C4          LDA $C4
260 0246 8D4B02        STA ADD+2
270 0249 A0FFFF        ADD LDA $FFFF  A CONTAINS THE CHARACTER
271 024C              ; FFFF IS A DUMMY ADDRESS, REAL FROM $00C3,C4
280 024C C923          CMP #'*      IS IT * ?
282 024E F00D          BEQ EXTEND  IF YES, BRANCH TO SUBROUTINE
284 0250 C925          CMP #'%      IS IT % ?
285 0252 D006          BNE E1
287 0254 A000          LDY #0       IF YES, CHANGE % TO *
288 0256 A923          LDA #'*
289 0258 91C3          STA ($C3),Y
299 025A 4CC200        E1 JMP $C2    BACK TO PARSING THE BASIC LINE
400 025D 20BC00        EXTEND JSR $00BC TEST FOR WHICH SUBROUTINE
410 0260 C943          CMP #'C
420 0262 F003          BEQ CLRSCR
450 0264 4C5C00        JMP $005C  BACK TO BASIC PARSING THE LINE
490 0267              ;
491 0267              ; ***** CLEAR SCREEN ROUTINE *****
492 0267              ;
493 0267              ; THE SCREEN CONSISTS OF 8 PAGES STARTING AT $D000
494 0267              ;
500 0267 A200          CLRSCR LDX #0
505 0269 86FE          STX SCREEN
506 026B A9D0          LDA #$D0
507 026D 85FF          STA SCREEN+1
510 026F A000          LDY #0
520 0271 A920          LDA #$20
530 0273 91FE        C2 STA (SCREEN),Y
540 0275 C8           INY
545 0276 C000          CPY #0
550 0278 D0F9          BNE C2
552 027A E6FF          INC SCREEN+1
555 027C E8           INX
556 027D E008          CPX #8
560 027F D0F2          BNE C2
565 0281 4CBC00        JMP $00BC
570 0284              ; JMP TO GET NEXT CHARACTER, A NULL, AND SO BASIC
571 0284              ; SEES THE END OF THE LINE OF SOURCE CODE AND GOES
572 0284              ; TO THE NEXT LINE.

```

List 3

```

10 REM BASIC PROGRAM TO ILLUSTRATE THE USE OF THE EXTENDED
11 REM FEATURE OF THE BASIC: THE RAPID SCREEN CLEAR.
15 PRINT"HI"
20 #C
30 PRINT"IS THE CHARACTER % A PROBLEM?"
35 PRINT"IS THE CHARACTER * A PROBLEM?"
40 PRINT"HERE IT COMES!":#C:PRINT"HERE IT WAS!"
50 S#C
60 PRINT"THAT ONE DIDN'T WORK"
70 REM THE "*" IN THE LINES 20,40 AND 50 WERE ENTERED FROM
71 REM THE KEYBOARD AS A "%".
OK

```

the parser, incrementing the character pointer again. We must drop the C as well as the # because the line "10C" would trigger a syntax ERROR break. So our line, which started as "10%C", finally looks to be just a naked "10" to BASIC, which it shrugs off as legal, but void of purpose.

When trouble shooting this program, it is very helpful to put a STA to screen just after line 270 so you can see what character is being messaged. In fact, I built a crude character-by-character trace routine by adding a call to the keyboard routine at \$FC00 so that each character remained on the screen to be puzzled over, until I hit a key and went on to the next. An elegant line-by-line trace routine could be built, triggered by the null at the end of each line of stored source code.

The line "#C", sans line number, executes o.k. in the immediate mode. One need not avoid the # or % symbols when placed in strings, as Listing 3 illustrates. Apparently the character parser never penetrates inside the quotes of a string. On the other hand, the line

```
1 REM ***** TIMING TEST PROGRAM *****
2 REM
5 B=1
10 FOR I=1 TO 10000
20 A=B
50 NEXT
90 REM
100 REM THE ABOVE PROGRAM IS THE "SHORT FORM"
101 REM THE LONG FORM REPLACES 2 LINES WITH:
102 REM S BC=1
103 REM 20 ABABAB=BCBCBC
104 REM THE LONG FORM HAS 10 MORE CHARACTERS TO PROCESS
105 REM DURING EACH CYCLE OF THE LOOP
106 REM
110 REM THE TIMES (SECONDS) TO RUN THE PROGRAM
111 REM USING THE STANDARD AND THE EXTENDED BASIC ARE
112 REM
114 REM          STANDARD    EXTENDED
115 REM SHORT          27          29
116 REM LONG           35          40
OK
```

"50 S#C" in Listing 3 looks like "10 S" to BASIC and causes an ERROR break.

Honesty now compels me to mention the price to be paid for extending BASIC. It stands at a computed 36 microseconds per character examined. This could be reduced somewhat by tightening up the code. This is the full price (in time units) because the extension subroutines, no matter how many, cost no time until they are called by

the letter following the # symbol. (Of course, there is also a price exacted in terms of memory space required.) Listing 4 gives an example of a program that spends relatively more time just examining characters than do typical programs. The cost per character is 0.08 milliseconds ((35-27)/100,000 extra characters) for the standard BASIC and 0.11 ms for the extended form of BASIC. That is about 0.03 ms or 30 microseconds more in the extended BASIC, in agreement with the above mentioned 36 microseconds.

I assembled this code using the "Ohio Scientific 6500 Assembler/Editor" and put it at \$C000 where I have 4K of memory (2102's on my old style 500 board). However, I suggest you put it at \$0222 in page 2 because this space is otherwise unused by our non-disk machines. You can tape it in the "Auto-load" mode using a program such as that given by Bruce Hoyt in MICRO 11:17. Then the drill for use is this: Cold start BASIC and break to the monitor. Autoload the code of Listing 2 with the start address at \$0222. The tape will finish loading,

modify zero page and jump to warm start of BASIC. It's easy (if your tape loader doesn't put noise into \$0000 as mine sometimes does).

I have a strong suspicion that I may have done some of these things the hard way. I would enjoy seeing some more elegant solutions to this "hooking". Even more practically, I would like to copy some useful extensions to BASIC from some future issues of MICRO. So how about it out there in 6502 land?

Edward Carlson is a professor of Physics at Michigan State University. He has been doing job-related programming for Michigan State since 1961, and he is especially interested in Fortran and Machine languages.

At the moment he is using graphics to teach Physics. He is planning to write more articles for Micro in the near future.

SYM-1

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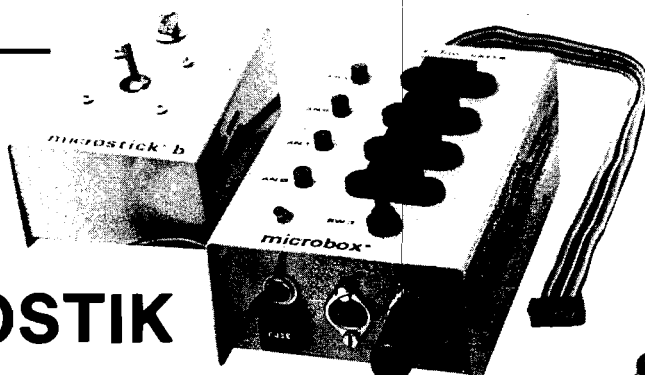
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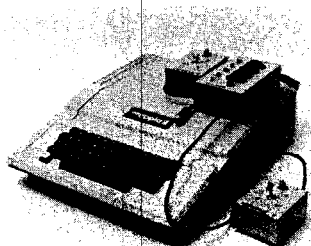
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SYM-1 BASIC Pack Program

A Pack routine which permits comments to be removed from Basic to permit faster execution and to save space is presented for the SYM-1.

George Wells

One of the most important aspects of writing good BASIC programs is the quality of the documentation contained in the program. The excellent Hayden book, "BASIC with Style", by Nagine and Ledgard, sets forth a standard by which BASIC programs should be written. This standard makes liberal use of REMarks, spaces and blank and indented lines to highlight and bring out the logical structure of the program. (See Appendix B, Prettyprinting Standards, of "BASIC with Style.") Unfortunately, with the limited amount of RAM available on most micro-implemented BASICs, by the time you write such a program you may not have memory available to run it or you may have severely reduced the allowable sizes of matrices or strings.

Now, if you have a SYM-1 you can have the best of both worlds with this BASIC Pack program. If the assembly language program is stored on tape it can be loaded into page one and run, all without leaving BASIC. In just a couple seconds, it will delete all insignificant spaces, NULL lines and extra colons and reduce all variable names to two characters or less. The packed program will run exactly as its parent with one exception: GOTO's and GOSUB's are not allowed to point to Null lines since they are deleted. (A Null line is one consisting of only colons, spaces and/or a REMark.) However, the parent program must be error free or the packed program might end up with different errors. In most cases, you will not pack a program until it is completely debugged. If you do need to change a program after it is packed, you should reload the parent and change it. Then be sure to always save the unpacked version of the program on tape before packing or all your documentation

work will be wasted.

The easiest way to use the Pack program is to make a copy of the object code on tape with an ID of \$31. Verify the object code before and after saving to make sure the stack has not clobbered it. Then jump to BASIC and write and save your well-documented BASIC program. Next enter the BASIC direct command LOAD 1. Read the tape with the Pack program on it. After it has LOADED, enter ?USR(270,0). This will run the Pack program and return to BASIC with an OK. Now you can treat the packed program just like any other program.

Another way to use the Pack program is to assemble it yourself. If you have RAE-1 and 8K of RAM you can copy the Assembly Listing and assemble it. However, before you do enter the following command:

```
SET $200 $1CFC $1D00 $1F00
```

Incidentally, there is a minor error in RAE-1 as can be seen at address 137 of the Assembly Listing. Page 4-6 of the second printing of the RAE-1 Reference Manual states the current PC (=) is the first byte of the next instruction after a branch: instead it is one less than this.

Since the Resident Assembler/Editor uses parts of page one, the object code is stored temporarily on page \$1F. After you save the text on tape you must RESET the SYM-1 to get the stack pointer away from the end of the BASIC Pack program area and then move the code to page one with the monitor command M 1 0E,1F0E-1FE2. Now follow the same procedure given above for using the object code.

If you have EPROM in your system, you can assemble the pro-

gram at some place in your EPROM or simply relocate the code to another page by changing all of the "01" bytes to the new page number. Of course, you will have to call the program by its correct address when you get ready to USR it.

To get an idea of what the BASIC pack program does a sample BASIC "program" is listed before and after packing. You should also be familiar with Appendix C, Space Hints, of the BASIC Reference Manual. One additional hint which is not mentioned is to use integer matrices instead of floating point matrices wherever possible. This saves 3 bytes per element: that's 363 bytes for DIM A %(10,10). There are other ways to save space: how about renumbering lines starting at zero and increasing by one or how about a program that determines which lines are not pointed to by any statements and packing consecutive such lines into long lines of up to 255 bytes each? These ideas are significantly more difficult to implement than those in this Pack program. For myself, I hope to have more memory before I need such a sophisticated program, but maybe someone else may take up the challenge to write one. μ

George Wells has been interested in computing since his high school days. He presently works at the Jet Propulsion Lab in Pasadena. Here he is employed in the instrumentation department where he makes custom designs for 6502-based systems microprocessors.

His wife, Marilyn, a registered nurse, does not share George's enthusiasm for computing, although their son, Bradley, age 5, loves to push the buttons. We understand that Bradley knows where the 'return' is located.

4.

```

01D0- 46 DA      SET NEXT CHAR FROM RAM
              <ALLOW SPACES>
              ;
01D2- 20 CC 00    SET NEXT CHAR FROM RAM
              <SKIP SPACES>
              ;
01D5- 48          DISALLOW SPACES AGAIN
01D6- A9 20
01D8- 85 DA
01DA- 68          BRANCH IF END OF LINE
01DB- F0 98
01DD- 90 03      BRANCH IF NUMERICAL
01DF- C9 22      SET EQUAL (<2> FLAG IF QUOTE
01E1- 38          SET NOT-NUMERICAL FLAG
01E2- 60          RTS
                     .EN

LABEL FILE: [ / = EXTERNAL ]

/OUT_POINT=007D
/FIX_LIN.PR=C320
/TEST_ALPHA=CCE9
/BASIC_PACK=010E
NEW_LINE=0144
NUMERICAL=014E
FIND_EOL=016F
DATA.CONT=018A
FIND_EDN=01AA
OUT_QUOTES=01C3
RTS=01E2
//0000,01E3,1FE3
>

```

OBJECT LISTING

```

.V 10E-1E2
010E 20 9F C4 85 7E A5 D3 85 83
0116 7D A2 FD 9A A0 00 84 DC 39
011E 20 CC 00 C8 91 7D C0 04 BF
0126 90 F6 A9 EF 85 DC A0 03 E0
012E B1 7D D0 12 98 65 7D 85 EF
0136 7D 90 02 E6 7E 20 6D C4 B3
013E 20 2C C3 4C 7E C2 A0 04 F2
0146 20 BE 01 C8 91 7D B0 0D 64
014E 20 B7 01 90 F8 C9 2E F0 AE
0156 F7 C9 45 F0 E8 C9 3A D0 61
015E 0A 88 C0 04 F0 E2 D1 7D 07
0166 F0 DE C8 C9 8E D0 2A 88 46
016E 88 20 D2 01 4C 6F 01 C8 45
0176 91 7D C0 06 90 98 98 18 F4
017E 65 7D 85 7D 90 93 E6 7E 5F
0186 80 8F 46 DA 20 B7 01 C9 5F
018E 2C F0 C9 3A F0 B1 D0 E8
0196 F1 C9 83 F0 EF 20 E9 CE DB
019E 90 A6 20 B7 01 90 05 20 9E
01A6 E9 CE 90 B1 20 D2 01 90 19
01AE FB 20 E9 CE B0 F6 38 B0 79
01B6 92 20 BE 01 C8 91 7D 60 20
01BE 20 D2 01 D0 1F C8 91 7D D8
01C6 20 D0 01 D0 F8 C8 91 7D 67
01CE D0 02 46 DA 20 C0 00 48 8D
01D6 A9 20 85 DA 68 F0 98 90 35
01DE 03 C9 22 38 60 8B
708B
.S2 31,10E-1E2

```

LIST

```

100 REM
110 REM
120 :
130 REM
140 REM
150 REM
160 :
170 : FIRST(I) = MIDDLE(I) + LAST(I)
180 : NEXT I : REM EXTRA COLONS
190 REM
200 REM
210 REM
220 : REM SUCH AS THIS ONE.
230 REM
240 REM
250 REM
260 PRINT "END OF LOOP"
270 REM
280 REM
290 DATA ONE, TWO, THREE, FOUR
300 DATA FIVE, SIX, SEVEN, EIGHT
310 DATA " THIS SENTENCE IS ONE STRING.
320 DATA " THIS ONE HAS LEADING SPACES.
330 REM
340 REM
350 A = 6.02 E23
360 REM
370 A = 6.02 E23
380 REM
390 REM
400 REM
410 REM
420 REM
430 50T0 420
OK
LOAD 1
LOADED
OK
708B (270,0)
OK
LIST
160 FOR I=1 TO 10
170 FI(I)=MI(I)+LA(I)
180 NEXT I
260 PRINT "END OF LOOP"
270 DATA ONE, TWO, THREE, FOUR
300 DATA FIVE, SIX, SEVEN, EIGHT
310 DATA " THIS SENTENCE IS ONE STRING.
320 DATA " THIS ONE HAS LEADING SPACES."
350 A=6.02E23
370 A=6.02E2
430 50T0 420
OK

```

** THIS IS A SAMPLE PROGRAM TO
 ** ILLUSTRATE HOW 'PACK' WORKS.

PACK REMOVES UNNEEDED SPACES AND
 COLONS AND SHORTENS UP VARIABLE
 NAMES.

FOR I = 1 TO 10

FIRST(I) = MIDDLE(I) + LAST(I)
 NEXT I : REM EXTRA COLONS

PACK DELETES NULL LINES
 NULL LINES ARE THOSE THAT HAVE
 NO EXECUTABLE STATEMENTS IN THEM.

REM SUCH AS THIS ONE.
 PACK WILL ALLOW SPACES BETWEEN
 PAIRS OF QUOTES.

END OF LOOP

PACK WILL ALLOW SIGNIFICANT
 SPACES IN DATA STATEMENTS.

DATA ONE, TWO, THREE, FOUR
 DATA FIVE, SIX, SEVEN, EIGHT

THIS SENTENCE IS ONE STRING.

THIS ONE HAS LEADING SPACES.
 PACK WILL NOT CONFUSE THE 'E' IN
 A CONSTANT WITH A VARIABLE NAME:

6.02 E23

COMPARE THE ABOVE WITH THE BELOW:
 6.02 E23

*****WARNING*****

MAKE SURE ALL LINE REFERENCES ARE
 TO LINES WITH EXECUTABLE STATEMENTS
 EXAMPLE: THE FOLLOWING LINE WILL
 PRODUCE AN ERROR.

50T0 420

OK

LOAD 1

LOADED

OK

708B (270,0)

OK

LIST

160 FOR I=1 TO 10

170 FI(I)=MI(I)+LA(I)

180 NEXT I

260 PRINT "END OF LOOP"

270 DATA ONE, TWO, THREE, FOUR

300 DATA FIVE, SIX, SEVEN, EIGHT

310 DATA " THIS SENTENCE IS ONE STRING.

320 DATA " THIS ONE HAS LEADING SPACES."

350 A=6.02E23

370 A=6.02E2

430 50T0 420

OK

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Share Your AIM Programs

Two features of the AIM, its 20 character printer and its built-in disassembler, are both a blessing and a bother. Together they make it very easy to dump uncommented listings. This program provides a method for combining the disassembler output with comments.

Jody Nelis

I've always had a problem sharing machine language programs while working with a small system. To publish a program you need a hard copy listing which can be photo graphically reproduced. Even though my programs are fully documented, they are all in a hand written form and not submissible for publication.

Hand typed program listings are notorious for small significant errors. For that reason, most publishers require a program listing produced by the system it is running on. Even if I could get a hand typed listing accepted, it would probably take me longer to prepare it for publication than it took to write it. Fast, accurate typing is just not one of my finer points.

The AIM is one up on many of the other single board systems in that it allows an error free mini-disassemble format and it has an on board printer to save the listings. It, however, lacks the ability to provide labels and comments with the listing. I feel that every published program should be fully documented to make it understandable. Full documentation also makes it useful to readers with other systems.

Many publishers agree with my feelings and don't publish hex dumps or AIM mini-disassemble listings. For lack of any easy way of preparing a program listing, a lot of good programming remains buried in my files and your files. Much of it

is probably labeled and commented but, like mine it is in an unsubmissible form.

The program presented here will eliminate this frustration. Using this program, you can prepare a fully labeled and commented hard copy program listing with a minimum of effort. It will merge your working program in RAM with your labels and comments in the AIM text editor into a pseudo-standard format and output a fully documented listing to an external printer. You will have no excuse for keeping your programs in the closet!

Program Overview

To run this program you should have your AIM populated to 4K of RAM. However, it can be done with as little as 2K. You will need access to an external printer with a minimum of 60 characters per line. If you don't have such a printer, you could save this program, your program, and your program comments on cassette using your AIM, and take them to a friend's house to be printed on his AIM and printer combination. A publisher with an AIM and printer combination could also prepare a publishable listing from your cassette and instructions. The on board AIM can be used for editing your listing prior to making a final tape.

This program, which I shall call MERGE for short, occupies the last two pages of the onboard 4K RAM block. It is easily relocatable to suit

your system by changing only the JSR and JMP arguments. It should reside in the top two pages of your system RAM.

When you have your particular program (which I will call the subject program) debugged and running the way it should, you are ready to prepare a documented listing. The normal AIM text editor commands are used to enter, edit and finalize the labels and comments for your subject program. This includes the use of the salvation of all poor typists the DELETE key! A coded entry is used to pack as much as possible into a limited capacity system.

MERGE will accommodate long label and comment listings by allowing multiple listings of editor data to cassette. Later, these blocks of data may be read back into the editor one at a time for use by MERGE.

MERGE is written for a continuous roll feed printer. It provides automatic paging with top and bottom margins for standard eleven inch sheets. Your program title and a sequential page number is printed at the top of each sheet except the first.

Once you have MERGE and your subject program loaded and your labels and comments finalized and loaded in the text editor, MERGE will print out the documented program listing. It will be 100% correct as far as your subject program code is concerned and 99 to 100% correct

as far as the labels and comments are concerned. The possible 1% error allowed is to cover a human-type operator's failings in proof reading the final listing.

Why This Program Was Written

Before undertaking the fun(?) of preparing this program, I took a quick look around to see if the answer already existed. If it does, it escaped me.

I looked into the AIM 4K Assembler ROM since there is a socket in my AIM all ready for it. From what I could gather, it is a dandy assembler but it's final listing is in two parts. While a source code listing and an object code listing could be worked together, it was not the solution I was after.

While I didn't scour the earth looking, I didn't run across anyone else making a ROM or EPROM which would plug into the assembler socket and do the job I wanted. And I didn't put much effort into examining any assembler-disassembler packages which would load into RAM since I don't have enough RAM to work with.

Trying to type the program listing into the text editor the way I wanted it to appear would just be a sneaky way of manually typing it. Not only would I make mistakes, but I would also pull my hair out trying to tab the columns while using the 20 character display. There also remained the problem of limited RAM. Spaces have a way of eating up editor RAM.

After throwing out all of these alternates out, it came down to the same old story; if you want it and can't find it, write it yourself!

Program Description

MERGE, as presented here, represents an effort to create a good structured, top down program. I utilized subroutine calls freely to allow easy extraction if any routines should be of value in future programming efforts. I tried to use a lot of relative branching to make the program relocatable with a minimum of argument changes.

All of my subject programs seem

to start at 0200 and grow upward as required. There is, ofcourse, a variable upper limit. Since my subject programs start at the bottom of the useful RAM, I put MERGE in the top of my RAM. It occupies 509 bytes from 0E00 to 0FFC.

This leaves a block of continuous RAM available between the top of the subject program and 0DFF. This block is used by the AIM text editor to prepare the labels and comments for the subject program. To make maximum use of this limited text editor capacity, the text is condensed to eliminate spaces and semicolons wherever possible.

Figure 1 is the subroutine TITLE listed by the AIM monitor "K" command. Figure 2 is a text editor listing of the labels and comments I have prepared to accompany this subroutine. As you can see, the data in figure 2 is quite condensed to conserve any wasted space.

```

K>* = 0E66
/ 11
0E66 A2 LDX #0F
0E68 20 JSR 0F7A
0E6B 20 JSR 0ECE
0E6E A0 LDY #00
0E70 B1 LDA (00),Y
0E72 C9 CMP #0D
0E74 F0 BEQ 0E79
0E76 20 JSR 0F6A
0E79 20 JSR E9F0
0E7C 20 JSR 0ECE
0E7F 60 RTS

```

Figure 1: Aim Mini-Disassemble Format Listing of 'Title' Subroutine

Figure 3 is the marriage of the two listings performed by MERGE. The condensed label and comment data has been separated and tabbed into the correct columns. The comments have been co-ordinated with the disassembly listing so that they fall on the correct lines.

The rules for inputting the label and comment data into the AIM text editor are spelled out in figure 4. It may appear complex and confusing at first, but, actually it is really quite easy to get the hang of it. If any errors are made in inputting the data or line codes, the printout will soon show it. Corrections are easily made

using the standard AIM text editor commands.

The complete program is listed in figure 5. MERGE has been used to produce it's own listing. Every available feature has been used and is illustrated in the listing.

The beauty of a fully labeled and commented program listing is that it pretty much tells it's own story. I need only comment on a few highlights of the various features here in the text.

The initialization portion of the listing sets as many registers as it can to their start values. Since the start address for the text editor varies with the size of the subject program, MERGE requests this information from the operator each time it is entered or re-entered with the prompt: "FROM = ". When a four digit address is entered from the keyboard followed by RETURN, the text editor start address is stored in a register and MERGE starts outputting data.

The brains for MERGE reside in the MAIN CONTROL LOOP which analyzes the first character of each data line in the text editor. It decodes the first character and calls upon the proper subroutine to format and print that line until the CR signifying the end of the line is encountered. The program then returns to the MAIN CONTROL LOOP to handle succeeding lines similarly. When the text editor end of data marker (00) is found, MERGE exits to the AIM monitor. If more data exists to finish the program listing, the text editor is reloaded from tape and MERGE is re-entered in a way not to disturb any of the paging registers. MERGE commences to print the new data until it once again finds an end of data marker.

The CHANGE DISASSEMBLE ADDRESS SUBROUTINE provides the co-ordination between the data in the text editor and the subject program. When an asterisk followed by a four digit hex address is encountered in a line in the editor, the pointers to the next instruction to be disassembled are changed to that address. Otherwise, the next consecutive program step is disassembled.

```

T>
;TITLE SUBROUTINE
=<L>
/17
OUT=
;TITLE SUBROUTINE
;TABS PRINTER TO START ON THE 16TH
                                SPACE
;PRINTS UNTILL A "CR" IS FOUND
*0E66
TITLE
  SPACESTAB OVER 15 SPACES
TITLE+INCPNT

  TELSB IF NEXT CHARACTER
    IS NOT "CR", PRINT
  END LINE UNTILL "CR" IS FOUND
  PRIOUT
END CRLF DO A CRLF
  INCPNTAND RETURN
END
=<Q>
<

```

Figure 2: Aim text Editor Listing of Labels and Comments Prepared for 'Title' Subroutine

Automatic paging with titles and page numbers is provided by subroutine PAGE. The routine is written to provide top and bottom margins for a standard eleven inch long page with six lines per inch. If your printer uses any other line spacing, you will have to adjust the argument for the instruction at 0E9B which determines if it is time to start a new page or not. Make a corresponding change to the argument for the instruction at 0E00 which initializes PAGE for six line feeds prior to starting the first page. It should be one less than the byte at 0E9B.

As fully explained in figure 4, re-entering MERGE with multiple text editor loads of labels and comments may be required when doing long programs with short memory. A cut and splice must be performed on the printout to eliminate the extraneous lines of data printed when re-entering. When the copy has been spliced, the paging continuity is restored. If for some reason, you want a continuous listing without the paging feature, NOP the JSR PAGE at 0E19.

I've found that the secret to getting the most out of a small system like the AIM is by being familiar with

the monitor ROM. I use as many subroutine calls to the monitor as I can to keep my programs short. While monitor subroutines are easy to get into, they don't always exit just when you want them to. When that happens, lift out the portions of the routine that you can use and rewrite it into your program. I've used portions of the monitor code, massaged to suit my needs, in my subroutines MERGE and ASCII TABLE PRINTOUT. I'm actually utilizing portions of the monitor "K" and "M" commands to achieve my listing. I had to handle their entry and exit differently and also control the pointers differently to get my desired results.

A very useful subroutine is MESSAGE. I use this routine regularly for prompts and comments in my interactive programs. It was derived from an almost identical monitor routine. The monitor routine, however, is locked into a message table in ROM and is of no use for direct subroutine calls. Put it in RAM as I have done. Set up your message table somewhere else in RAM and call with X set to the start of the message you want. MESSAGE will sequentially output the bytes in the table to the display/printer until it encounters a

stop byte. The stop byte will have it's MSB set to a one. For example, an ASCII space is 20 hex. To make this a stop byte, change it to a A0 hex in the table. A message table can be up to 256 characters long using indexed addressing or longer using indirect indexed addressing. Type ASCII messages into the memory table using the AIM text editor normally. Then go back and locate the end of the individual messages using the "M" command. Change the last byte of each message to a stop byte with "/" command.

No special tricks are used in MERGE; it fit into the two pages I had allocated for it without having to get fancy. By keeping all of the subroutines intact and separate, and maybe even a little redundant in places, it should be easier to follow and understand.

Operating Instructions

Type in Merge from figure 5 and save 006 to 0015, 010C to 0111 and 0E00 to 0FFC on tape. The F2 key has been initialized for initial entry of MERGE. The F1 key has been initialized for the re-entry point when using multiple text editor data loads. Refer to figure 4 for complete operating instructions.

Subheading: Further Enhancements

Since MERGE relies on finding coded data in the text editor and merely processes it to the desired format, there is not much more you could do with it. You could adjust the tab locations to get wider titles or maybe let MERGE format the MONITOR EQUATES and REGISTERS USED sections. I chose to do them manually to avoid having too many confusing input coding designations. You could change the "CONTROL S" code to a "CONTROL B" code if that helps you remember a blank line easier.

If you have your tape recorder running under remote control, you could write a patch which would let MERGE reload the text editor with a new section of data when required. This would save you the chore of doing it manually each time. You would have to tape all of the data sections in the proper sequence. They would all have to be loaded in-

to the editor at the same start address. Add another flag at the end of the last data section to let MERGE know that it was totally finished with the listing and may exit to the AIM monitor. With 110 baud printers and long programs, you could start MERGE up and walk away for hours while it prints. Maybe you could even visit your family for a while!

Another possibility might be a small program to control the data input into the editor. It would be handy to control the maximum comment length to avoid exceeding the width

of your printer. This could reside in the same RAM location that MERGE resides in since only one at a time would be used.

Summary

With the availability of MERGE, every AIM-65 owner now has a memory efficient and easy to use means of listing his fully documented program. MERGE will be useful to you even if you don't have an external printer. Your subject program, your labels, comments and MERGE can all be saved

on cassette. Another AIM owner with a printer or a publisher with an AIM/printer can then produce the publishable listing from your cassette.

Sharing programs benefits us all. If we can eliminate duplicate efforts, we can concentrate on a new application. I'm looking forward to seeing your favorite program in print. While I probably won't be able to use all of them exactly as written, I am sure I'll learn a programming trick or two and be able to lift some of your subroutines out for my use. Get them documented and listed by MERGE and get them in the mail.

μ

1>FROM=0200

Figure 3: Formatted Listing of 'Title' Subroutine Produced by 'MERGE'. Date in Figure 1 and Figure 2 has been combined

```

;TITLE SUBROUTINE
;TABS PRINTER TO START ON THE 16TH SPACE
;PRINTS UNTILL A "CR" IS FOUND
*=0E66

IITLE 0E66 A2 LDX #0F
      0E68 20 JSR 0F7A SPACES ;TAB OVER 15 SPACES
IITLE1 0E6B 20 JSR 0ECE INCPNT
      0E6E A0 LDY #00
      0E70 B1 LDA (00),Y IELSB ;IF NEXT CHARACTER
      0E72 C9 CMP #0D ;IS NOT "CR", PRINT
      0E74 F0 BEQ 0E79 END ;LINE UNTILL "CR" IS FOUND
      0E76 20 JSR 0F6A PRIOUT
END 0E79 20 JSR E9F0 CRLF ;DO A CRLF
    0E7C 20 JSR 0ECE INCPNT ;AND RETURN
    0E7F 60 RTS

```

<

Figure 4

MERGE COMMENTS WITH DISASSEMBLY

MERGES LABELS UP TO 6 CHARACTERS
AND COMMENTS UP TO 35 CHARACTERS
WITH AIM MINI DISASSEMBLE FORMAT
FOR PRINTING TO EXTERNAL PRINTER
USING 8 1/2" WIDE CONTINUOUS
FEED ROLL PAPER-PROVIDES PAGING

BY JODY NELIS, K3JZL
DECEMBER, 1979

REGISTERS USED

0000	IELSB	TEXT EDITOR POINTER
0001	TEMSB	TEXT EDITOR POINTER
0002	LCOUNT	LINE COUNTER
0003	PCOUNT	PAGE COUNTER
0004	ITLSB	TITLE POINTER
0005	ITMSB	TITLE POINTER
00EA	LENGTH	BYTES IN ARGUMENT
A415	CURPOS	CURSOR POSITION
A419	COUNT	DISASSEMBLE LINE COUNT
A41C	ADDR	ADDRESS POINTER
A41D	ADDR+1	ADDRESS POINTER
A425	SAVPC	PROGRAM COUNTER SAVE
A426	SVPC+1	PROGRAM COUNTER SAVE

MONITOR EQUATES

E1A1	COMIN	RETURN TO MONITOR
E610	NXT4	PRINT NEXT 4 BYTES
E615	NOW4	PRINT 4 BYTES
E7A3	FROM	INPUT 4 DIGIT ADR
E7D8	EQUAL	OUTPUT = SIGN
E83B	BLANK2	OUTPUT 2 SPACES
E83E	BLANK	OUTPUT 1 SPACE
E97A	OUTPUT	OUTPUT ASCII BYTE
EA46	NUMA	OUTPUT HEX BYTE
EA84	PACK	2 ASCII BYTES INTO 1 HEX BYTE
EB44	CLR	CLEAR DISPLAY POINTER
EF90	CRLF	OUTPUT A CRLF
F46C	DISASM	DISASSEMBLE 1 LINE

*=010C
;INITIALIZE USER KEYS

F1	010C	4C	JMP 0E5F	KE-ENT	RE-ENTER MAIN ROUTINE
F2	010F	4C	JMP 0E00	ENTER	ENTER MAIN ROUTINE

==0E00
;INITIALIZE REGISTERS

INIT	0E00	A9	LDA #39		SET UP LINE COUNTER
	0E02	85	STA 02	LCOUNT	FOR INITIAL FEED
	0E04	A9	LDA #00		
	0E06	85	STA 03	PCOUNT	SET PAGE COUNTER TO ZERO
RENT	0E08	20	JSR E7A3	FROM	
	0E0B	A0	LDA A41C	ADDR	GET THE TEXT EDITOR

Continued on page 29

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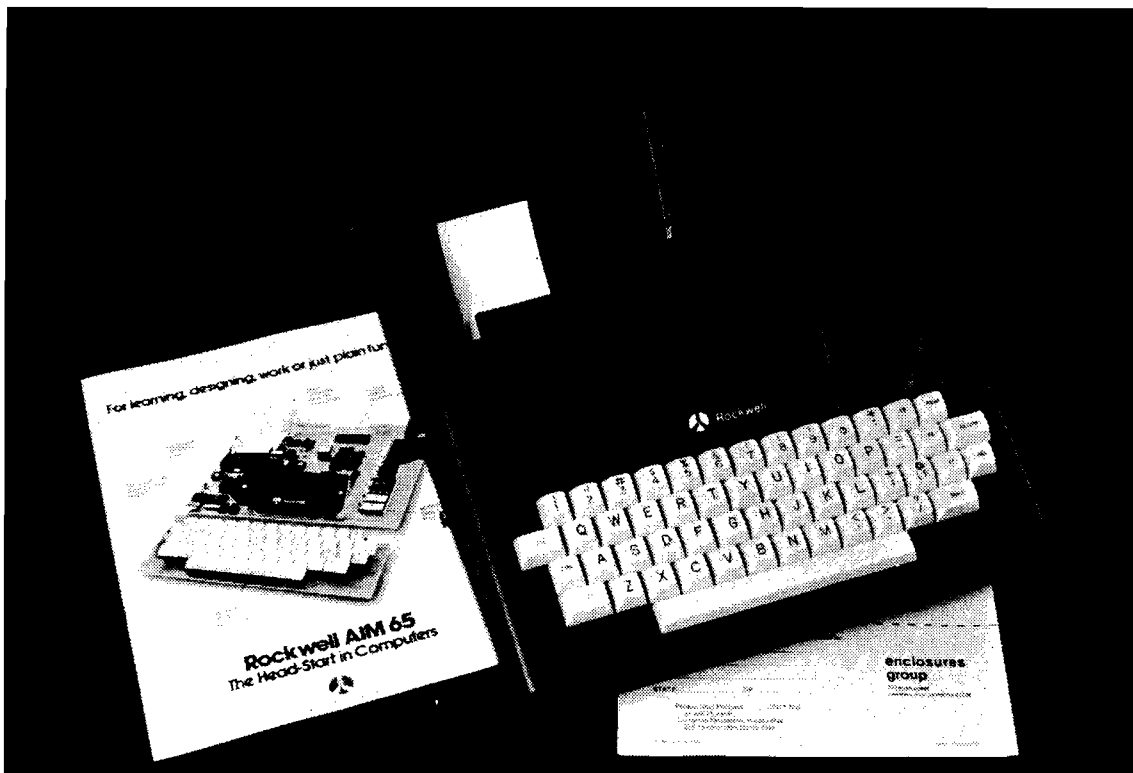
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```

0E0E 85 STA 00      ;START ADDR AND PUT
0E10 85 STA 04      ;II IN THE REGISTERS
0E12 AD LDA A4D     ADDR+1
0E15 85 STA 01      IEMSB
0E17 85 STA 05      IITMSB

;MAIN CONTROL LOOP
;EXAMINE THE FIRST CHARACTER OF EACH LINE
;AND DETERMINE'S PROPER PRINTING FORMAT
MAIN      0E19 20 JSR 0E97 PAGE
0E1C A0 LDY #00
0E1E H1 LDA (00),Y
0E20 C9 CMP #13
0E22 D0 BNE 0E2A
0E24 20 JSR 0E8D
0E27 4C JMP 0E19
0E2A C9 CMP #2A
0E2C D0 BNE 0E34
0E2E 20 JSR 0E8D
0E31 4C JMP 0E19
0E34 C9 CMP #01
0E36 D0 BNE 0E3E
0E38 20 JSR 0F14
0E3B 4C JMP 0E19
0E3E C9 CMP #36
0E40 D0 BNE 0E48
0E42 20 JSR 0E8D
0E45 4C JMP 0E19
0E48 C9 CMP #14
0E4A D0 BNE 0E52
0E4C 20 JSR 0E66
0E4F 4C JMP 0E19
0E52 C9 CMP #00
0E54 F0 BEQ 0E5C
0E56 20 JSR 0F81
0E59 4C JMP 0E19
0E5C 4C JMP E1A1
0E5E 4C JMP 0E08
0E63 4C JMP 0E08

;RE-ENTER MAIN CONTROL LOOP
;USED WHEN MEMORY WILL NOT HOLD ALL
;OF THE COMMENTS AND LABELS AT ONCE
;IF FIRST LINE OF ALL SECTIONS MUST BE THE TITLE
RE-ENT 0E5F 20 JSR 0FF6
0E62 EA NOP
0E63 4C JMP 0E08

;TITLE SUBROUTINE
;TABS PRINTER TO START ON THE 16TH SPACE
;PRINTS UNTILL A "CR" IS FOUND
TITLE   0E66 A2 LDY #07A
0E68 20 JSR 0F7A
0E6B 20 JSR 0ECE
0E6E A0 LDY #00
0E70 H1 LDA (00),Y
0E72 C9 CMP #0D
0E74 F0 BEQ 0E79
0E76 20 JSR 0F6A
0E79 20 JSR E9F0
0E7C 20 JSR 0ECE
0E7F 60 RTS

;TABS PRINTER TO START ON 16TH SPACE WITH A "J"
;COMMENT LINE SUBROUTINE
;PRINTS UNTILL A "CR" IS FOUND
;SAVE SEMICOLON
COMMENT 0E80 48 PHA
0E81 A2 LDY #0F
0E83 20 JSR 0F7A
0E86 68 PLA
0E87 20 JSR E97A
0E8A 38 SEC
0E8B B0 BCS 0E6B
0E8C 40 INY
0E8D 20 JSR E9F0
0E90 20 JSR 0ECE
0E93 20 JSR 0ECE
0E96 60 RTS

;BLANK SUBROUTINE
;INSERTS A BLANK LINE IN THE PRINTOUT
;DO A CRLF
BLANK   0E8D 20 JSR E9F0
0E90 20 JSR 0ECE
0E93 20 JSR 0ECE
0E96 60 RTS

;PAGE SUBROUTINE
;PROVIDES AUTOMATIC PAGING WITH
;TITLES AND PAGE NUMBERS
PAGE    0E97 E6 INC 02
0E99 A5 LDA 02
0E9B C9 CMP #3A
0E9D D0 BNE 0ECD
0E9F A2 LDY #04
0EA1 20 JSR E9F0
0EA4 CA DEX
0EA5 D0 BNE 0EA1
0EA7 86 STX 02
0EA9 E6 INC 03
0EAB A5 LDA 03
0EAD C9 CMP #01
0EAF F0 BEQ 0ECD
0EB1 BA TAX
0EB2 A8 IAY
0EB3 B1 LDA (04),Y
0EB5 C9 CMP #0D
0EB7 F0 BEQ 0EBF
0EB9 20 JSR E97A
0EBC C8 INY
0EBD D0 BNE 0EB3
0EBF 20 JSR 0FE3
0EC2 A5 LDA 03
0EC4 20 JSR EA46
0EC7 20 JSR E9F0
0ECA 20 JSR E9F0
0ECD 60 RTS

;INCREMENT POINTER SUBROUTINE
;INCREMENT TEXT EDITOR POINTERS
;INCREMENT LSB POINTER
;RETURN IF NOT END OF PAGE
;INCREMENT MSB POINTER
;RETURN
;CHANGE DISASSEMBLE ADDRESS SUBROUTINE
;ALTERS POINTERS FOR NEXT DISASSEMBLED LINE
;TAB OVER 15 SPACES
ADDRIN 0ED5 48 PHA
0ED6 A2 LDY #0F
0ED8 20 JSR 0F7A
0ED9 20 JSR 0F7A
0EDB 20 JSR 0F7A
0EDC 20 JSR 0F7A
0EDF 60 RTS

```

```

0E7C 20 JSR 0ECE
0E7F 60 RTS

;TABS PRINTER TO START ON 16TH SPACE WITH A "J"
;COMMENT LINE SUBROUTINE
;PRINTS UNTILL A "CR" IS FOUND
;SAVE SEMICOLON
COMMENT 0E80 48 PHA
0E81 A2 LDY #0F
0E83 20 JSR 0F7A
0E86 68 PLA
0E87 20 JSR E97A
0E8A 38 SEC
0E8B B0 BCS 0E6B
0E8C 40 INY
0E8D 20 JSR E9F0
0E90 20 JSR 0ECE
0E93 20 JSR 0ECE
0E96 60 RTS

;BLANK SUBROUTINE
;INSERTS A BLANK LINE IN THE PRINTOUT
;DO A CRLF
BLANK   0E8D 20 JSR E9F0
0E90 20 JSR 0ECE
0E93 20 JSR 0ECE
0E96 60 RTS

;PAGE SUBROUTINE
;PROVIDES AUTOMATIC PAGING WITH
;TITLES AND PAGE NUMBERS
PAGE    0E97 E6 INC 02
0E99 A5 LDA 02
0E9B C9 CMP #3A
0E9D D0 BNE 0ECD
0E9F A2 LDY #04
0EA1 20 JSR E9F0
0EA4 CA DEX
0EA5 D0 BNE 0EA1
0EA7 86 STX 02
0EA9 E6 INC 03
0EAB A5 LDA 03
0EAD C9 CMP #01
0EAF F0 BEQ 0ECD
0EB1 BA TAX
0EB2 A8 IAY
0EB3 B1 LDA (04),Y
0EB5 C9 CMP #0D
0EB7 F0 BEQ 0EBF
0EB9 20 JSR E97A
0EBC C8 INY
0EBD D0 BNE 0EB3
0EBF 20 JSR 0FE3
0EC2 A5 LDA 03
0EC4 20 JSR EA46
0EC7 20 JSR E9F0
0ECA 20 JSR E9F0
0ECD 60 RTS

;INCREMENT POINTER SUBROUTINE
;INCREMENT TEXT EDITOR POINTERS
;INCREMENT LSB POINTER
;RETURN IF NOT END OF PAGE
;INCREMENT MSB POINTER
;RETURN
;CHANGE DISASSEMBLE ADDRESS SUBROUTINE
;ALTERS POINTERS FOR NEXT DISASSEMBLED LINE
;TAB OVER 15 SPACES
ADDRIN 0ED5 48 PHA
0ED6 A2 LDY #0F
0ED8 20 JSR 0F7A
0ED9 20 JSR 0F7A
0EDB 20 JSR 0F7A
0EDC 20 JSR 0F7A
0EDF 60 RTS

```

```

0FCA C9 CMP #20      DEFALT      IF SPACE GO TO DEFALT
0FCC F0 BEQ 0F09      OUTPUT
0FCE 20 JSR E97A      INCPNT
0FD1 20 JSR 0FCE      GET THE NEXT CHAR
0FDA CA DEX
0FDB 00 BNE 0FC8      IF 6 CHARS PRINTED, RETURN
0FDD 20 JSR 0FCE      LEAVE
0FDE 00 BNE 0F09      OTHERWISE TAB TO FILL
0FDF 20 JSR 0FCE      IF ALL 6 ALLOCATED SPACES
0FE2 60 RTS          AND RETURN

DEFALT
LEAVE

MESSAGE SUBROUTINE
:OUTPUTS ASCII MESSAGE FROM TABLE
:GET CHARACTER
MESS 0FE3 B5 LDA 06,X   MTABLE
0FE5 48 PHA
0FE6 29 AND #7F
0FE8 20 JSR E97A      MASK BIT 8
0FEB 28 INX           PRINT CHARACTER
0FEC 68 PLA           IF TABLE VALUE JUST PRINTED
0FED 10 BPL 0FE3      IF WAS NOT NEGATIVE,
0FEF 60 RTS          GET NEXT CHARACTER

:PATCH SUBROUTINE
:FIXES TO OTHER ROUTINES TO AVOID CHANGING BRANCHES
PATCH1 0FF0 A0 LDY #00
0FF2 20 JSR 0FC6      INCREMENT LINE COUNTER SO
0FF5 60 RTS          TITLE & * LINE WILL
PATCH2 0FF6 C6 DEC 02
0FF8 C6 DEC 02        NOT COUNT FOR PAGING
0FFA C6 DEC 02
0FFC 60 RTS

MESSAGE TABLE
:USED BY MESSAGE SUBROUTINE
:JTAB SPACES
<M>=0006 20 20 20 20 - - - - JTAB SPACES
<M>=000A 50 41 47 45 P A G E IPAGE HEADING
<M>=000E A0 20 20 20 - - - - JTAB SPACES
<M>=0012 3C 4D 3E BD < M > = JASCII TABLE PREFIX

:END OF LISTING

```

Figure 5

- MERGE COMMENTS WITH DISASSEMBLY - OPERATING INSTRUCTIONS

1. INITIALIZE THE TEXT EDITOR WITH THE "E" COMMAND. DEFINE THE LIMITS TO START JUST ABOVE THE TOP OF YOUR SUBJECT PROGRAM AND END JUST BELOW THE START OF MERGE.
 2. THE FIRST LINE ENTERED INTO THE TEXT EDITOR MUST BE A "TITLE LINE" CONTAINING THE NAME OF YOUR PROGRAM. THIS IS THE LINE THAT WILL BE PRINTED AT THE TOP OF SHEETS 2 AND UP OF YOUR PROGRAM LISTING. SEE BELOW FOR "TITLE LINE" DIRECTIONS.
 3. ALL LINES ENTERED INTO THE TEXT EDITOR WILL FALL INTO ONE OF THE FOLLOWING SIX CATEGORIES. INPUT EACH LINE INTO THE EDITOR ACCORDING TO THE FOLLOWING INSTRUCTIONS:

- A. BLANK LINE
- 1) TYPE IN AS "CONTROL S" "RETURN".
 - 2) DO NOT USE "SPACE" "RETURN".
 - 3) PROVIDES A LINE FEED WHEN ENCOUNTERED.
- B. TITLE LINE
- 1) LINE MUST START WITH A "CONTROL T" AND END WITH "RETURN".
 - 2) TABS PRINTER TO PRINT THE LINE STARTING AT THE 16TH CHARACTER SPACE. THE "CONTROL T" IS IGNORED. 3) LENGTH OF LINE IS LIMITED BY PRINTER WIDTH.
- C. COMMENT LINE
- 1) LINE MUST START WITH A SEMICOLON (;) AND END WITH "RETURN".
 - 2) TABS PRINTER TO PRINT THE LINE STARTING AT THE 16TH CHARACTER SPACE. THE SEMICOLON IS PRINTED. 3) LENGTH OF LINE IS LIMITED BY THE PRINTER WIDTH.
- D. ASTRIX LINE
- 1) LINE MUST START WITH AN ASTRIX (*).
 - 2) DEFINES THE ADDRESS FOR THE NEXT INSTRUCTION TO BE LISTED BY A "DISASSEMBLED PROGRAM LINE".
 - 3) TYPE IN AS "*0200" "RETURN", FOR EXAMPLE, WITH "0200" BEING THE DESIRED ADDRESS IN THE SUBJECT PROGRAM.
 - 4) TABS PRINTER TO PRINT THE LINE AS "*=0200" STARTING AT THE 16TH CHARACTER SPACE.
 - 5) MUST BE ENTERED AHEAD OF THE FIRST "DISASSEMBLED PROGRAM LINE" IN EACH SECTION OF THE TEXT EDITOR TO DEFINE THE START ADDRESS.
 - 6) MERGE WILL THEN CONTINUE TO DISASSEMBLE CONSECUTIVE PROGRAM STEPS EACH TIME A "DISASSEMBLED PROGRAM LINE" FORMAT IS CALLED FOR UNTILL ANOTHER "ASTRIX LINE" IS ENCOUNTERED.
 - 7) AN "ASTRIX LINE" MAY BE INSERTED AT ANY TIME TO JUMP TO A NEW LOCATION OR TO SKIP GAPS IN THE SUBJECT PROGRAM.
- E. ASCII TABLE LINE
- 1) LINE MUST START WITH A "CONTROL A" AND END WITH A "RETURN".
 - 2) THE FIRST LINE OF EACH TABLE MUST FOLLOW THE "CONTROL A" WITH THE SEQUENCE "*0006", FOR EXAMPLE, WITH THE "0006" BEING THE ADDRESS OF THE START OF THE MESSAGE TABLE IN THE SUBJECT PROGRAM. SUCCESSIVE LINES STARTING WITH ONLY "CONTROL A" WILL LIST THE NEXT CONSECUTIVE FOUR BYTES OF THE TABLE.
 - 3) THE ALPHANUMERIC CHARACTERS FOR THAT LINE OF THE TABLE ARE THEN ENTERED AS "ABCD", FOR EXAMPLE. THERE MUST BE 4 CHARACTERS PER LINE ENTERED. USE SPACES IF REQUIRED TO FILL OUT THE LAST LINE.
 - 4) IF THERE ARE NO COMMENTS TO BE ADDED TO THIS LINE, TYPE "RETURN" AND GO ON TO THE NEXT LINE.
 - 5) IF THERE ARE COMMENTS FOR THIS LINE, BEGIN TYPING THEM IMMEDIATELY AFTER THE 4TH ALPHANUMERIC CHARACTER HAS BEEN ENTERED. THEY WILL BE RUN TOGETHER

IN THE TEXT EDITOR BUT MERGE WILL SEPARATE THEM AND ADD A SEMICOLON WHEN PRINTING. END THE LINE WITH "RETURN".

6) LENGTH OF COMMENTS LIMITED BY PRINTER WIDTH.

F. DISASSEMBLED PROGRAM LINE

- 1) IF A LINE STARTS WITH ANY THING OTHER THAN A "CONTROL S", "CONTROL T", "CONTROL A", ASTRIX OR SEMICOLON, THE LINE WILL BE CREATED AS A DISASSEMBLED PROGRAM LINE.
 - 2) IF THERE ARE NO LABELS OR COMMENTS FOR THIS LINE, TYPE "SPACE" "SPACE" "RETURN" AND GO ON TO THE NEXT LINE.
 - 3) WHEN THEY ARE DESIRED, A PROGRAM LABEL, AN ARGUMENT LABEL AND COMMENTS MAY BE ENTERED FOR A LINE. THEY ARE ALWAYS ENTERED IN THAT ORDER. A LINE NEED NOT HAVE ALL OF THEM, JUST THE ONES YOU DESIRE.
 - 4) IF THERE IS NO PROGRAM LABEL FOR THIS LINE, TYPE ONE "SPACE". THIS WILL DEFAULT TO SIX SPACES WHEN PRINTING. IF THERE IS A PROGRAM LABEL FOR THIS LINE, TYPE IT IN. A LABEL MAY NOT BE MORE THAN SIX CHARACTERS LONG. IF IT IS LESS THAN 6 CHARACTERS LONG, TYPE THE LABEL FOLLOWED BY ONLY ONE "SPACE". THE REQUIRED SPACES WILL BE PUT IN WHEN PRINTING.
 - 5) NEXT, FOLLOW THE IDENTICAL INSTRUCTIONS FOR THE ARGUMENT LABEL (IF ANY). IF THE PROGRAM LABEL WAS THE FULL 6 CHARACTERS LONG, THE 2 LABELS WILL BE RUN TOGETHER IN THE EDITOR (EX: "FLABELALABEL"). THE PRINT ROUTINE WILL SEPARATE THEM.
 - 6) IF THERE ARE NO COMMENTS FOR THIS LINE, TYPE "RETURN" AND GO ON TO THE NEXT LINE.
 - 7) IF THERE ARE COMMENTS TO BE ADDED TO THIS LINE, BEGIN TYPING THEM IMMEDIATELY AFTER THE ARGUMENT LABEL OR DEFAULT SPACE. IF THE ARGUMENT LABEL WAS THE FULL 6 CHARACTERS LONG, THE LABEL AND COMMENTS WILL BE RUN TOGETHER IN THE EDITOR (EXAMPLE: "ALABELCOMMENTS..."). THE PRINT ROUTINE WILL SEPARATE THEM AND WILL ALSO PREFIX THE COMMENTS WITH A SEMICOLON. END THE LINE WITH "RETURN".
 - 8) LENGTH OF COMMENTS IS LIMITED BY PRINTER WIDTH.
4. WHEN ALL OF THE LINES HAVE BEEN ENTERED OR YOU RUN OUT OF MEMORY IN THE EDITOR, TERMINATE THE TEXT EDITOR INPUT WITH THE NORMAL "RETURN" "RETURN" SEQUENCE. IF YOU HAVE RUN OUT OF MEMORY, RE-ENTER THE TEXT EDITOR WITH THE "T" COMMAND AND THEN GO TO THE BOTTOM WITH THE "B" COMMAND. DELETE THE LAST TWO OR THREE LINES WITH THE "K" COMMAND TO OBTAIN A LITTLE EDITING ROOM IF YOU SHOULD NEED IT LATER.

5. EXIT THE TEXT EDITOR WITH THE "Q" COMMAND.

6. LOAD MERGE AND YOUR SUBJECT PROGRAM INTO RAM.

7. START MERGE WITH THE "F2" (J) KEY AND RESPOND TO "FROM=" WITH THE 4 DIGIT START ADDRESS THAT YOUR TEXT EDITOR HAS

WAS SET TO FOLLOWED BY "RETURN". YOUR SUBJECT PROGRAM AND YOUR LABELS AND COMMENTS WILL BE MERGED AND FORMATTED AS THEY ARE PRINTED OUT. WHEN THE END OF THE DATA IN THE TEXT EDITOR IS REACHED, MERGE WILL EXIT TO THE AIM MONITOR. MAKE A RECORD OF THE CONTENTS OF 0002H AND 0003H AT THIS TIME. YOU WILL NEED TO KNOW IT LATER.

8. MAKE ANY CORRECTIONS TO THE DATA IN THE TEXT EDITOR BY RE-ENTERING THE EDITOR WITH THE "T" COMMAND. USE THE STANDARD AIM EDITING COMMANDS AND THE SAME DATA INPUT RULES TO FIX UP WHATEVER LINES NEED CHANGED. PRINT ANOTHER LISTING FOLLOWING THE INSTRUCTIONS IN STEP 7 AGAIN. WHEN VERIFIED CORRECT, SAVE THE TEXT EDITOR DATA ON TAPE USING THE "L" COMMAND.

9. NOTE THAT IF YOU LIST YOUR TEXT EDITOR DATA ON THE AIM THERMAL PRINTER, IT WILL PRINT AN "A", "S" OR "T" WHEN IT FINDS A "CONTROL A", "CONTROL S" OR "CONTROL T" RESPECTIVELY IN THE TEXT EDITOR. THIS WILL NOT PRINT DURING THE RUNNING OF MERGE NOR WILL IT PRINT IF YOU LIST THE TEXT EDITOR DATA TO AN EXTERNAL PRINTER.

10. IF YOUR LABELS AND COMMENTS ALL FIT INTO YOUR TEXT EDITOR AT ONE TIME AND THE LISTING PRODUCED IS COMPLETE AND TO YOUR SATISFACTION, YOU ARE DONE. SAVE MERGE, YOUR SUBJECT PROGRAM AND THE LABEL AND COMMENT DATA ON TAPE IN CONSECUTIVE SAVEDS TO PERMIT LISTING IT IN THE FUTURE. YOU MUST HAVE ALL THREE OF THEM IN RAM AT ONCE TO RUN A LISTING. MERGE DOESN'T COMBINE THE PROGRAM AND COMMENTS IN RAM, IT JUST PRINTS THEM OUT TOGETHER.

11. IF YOUR TEXT EDITOR RAN OUT OF CAPACITY BEFORE YOU GOT ALL THE WAY THROUGH YOUR SUBJECT PROGRAM DOCUMENTATION, ADDITIONAL SECTIONS OF DATA WILL BE REQUIRED TO COMPLETE THE LISTING. THE INSTRUCTIONS FOLLOWING WILL BE APPLICABLE FOR SECTIONS 2, 3, 4, ETC. OF THE LABEL AND COMMENT INPUT AND PRINTING:

A. MAKE CERTAIN THAT YOU HAVE A GOOD SAVE ON TAPE OF THE DATA FOR THE LAST SECTION THAT IS IN THE TEXT EDITOR. INITIALIZE YOUR TEXT EDITOR AGAIN AND SET THE UPPER AND LOWER LIMITS THE SAME AS THE LAST SECTION WAS. YOU ARE NOW READY TO INPUT ANOTHER SECTION OF DATA.

B. THE FIRST LINE OF EACH SECTION MUST BE THE TITLE OF THE PROGRAM IN A "TITLE LINE" FORMAT. THIS MUST READ THE SAME AS THE TITLE LINE IN THE FIRST SECTION.

C. THE SECOND LINE OF EACH SECTION MUST BE AN "ASTRIX LINE" CONTAINING THE ADDRESS OF THE NEXT INSTRUCTION TO BE DISASSEMBLED. THE CONTINUITY IS LOST EACH TIME MERGE EXITS TO THE MONITOR AND IT MUST BE RESTORED UPON RE-ENTRY BY THE DATA IN THE EDITOR.

D. INPUT LABEL AND COMMENT DATA INTO THE TEXT EDITOR STARTING JUST AFTER THE LAST SECTION LEFT OFF. USE

THE SAME INPUT RULES AS OUTLINED IN INSTRUCTION 3 AND DO INSTRUCTIONS 4 AND 5.

E. RE-ENTER MERGE WITH THE "F1" (C) COMMAND. RESPOND TO THE "FROM=" PROMPT THE SAME AS BEFORE (INSTRUCTION 7). MERGE WILL AGAIN PRINT UNTILL IT RUNS OUT OF DATA IN THE TEXT EDITOR. WHEN IT EXITS TO THE AIM MONITOR, MAKE A RECORD OF THE CONTENTS OF 0002 AND 0003 AGAIN.

F. MAKE ANY CORRECTIONS NEEDED TO THIS SECTION USING THE TEXT EDITOR COMMANDS AGAIN.

G. REGISTERS 0002 AND 0003 KEEP TRACK OF THE LINE COUNT AND THE PAGE COUNT FOR THE PAGE SUBROUTINE. WHEN MERGE IS ENTERED WITH "F2" (J), THEY ARE INITIALIZED TO START FROM PAGE 1, LINE 1. AS THE TEXT IS PRINTED, THEY ARE INCREMENTED. WHEN EDITING AND REPRINTING THE FIRST SECTION OF DATA AGAIN USING "F2" (J), THE REGISTERS WOULD BE RESET AND REINCREMENTED EACH TIME.

WHEN YOU RE-ENTER MERGE WITH THE "F1" (C) KEY, THESE REGISTERS ARE NOT RESET. THEY START WHERE THEY LEFT OFF AND CONTINUE TO INCREMENT. THIS IS DONE TO PRESERVE THE PAGING WHEN DOING SEQUENTIAL RUNS USING MULTIPLE DATA SECTIONS.

HOWEVER, WHEN RUNNING THE SAME SECTION OVER A FEW TIMES DURING THE COURSE OF CORRECTING AND RUNNING SUBSEQUENT PROOF COPIES, THE SE REGISTERS GET ALL OUT OF SYNC. FOR THAT REASON YOU MUST CHECK THE VALUES OF THE SE REGISTERS AFTER EACH RUN AND RECORD THEM. TO GET THE PAGING BACK IN SYNC, MANUALLY SET 0002 AND 0003 TO THE VALUE THAT THEY WERE AT AFTER THE LAST SECTION WAS FINALIZED AND RUN. FOR EXAMPLE, LETS SAY YOU ARE ON THE SECOND SECTION. THE FIRST SECTION ENDED UP WITH 2A IN 0002 AND 02 IN 0003. BEFORE YOU RERUN ANOTHER PROOF COPY OF SECTION 2, MANUALLY SET 0002 TO 2A AND 00003 TO 02. THEN RERUN WITH THE "F1" (C) KEY.

IF YOU SHOULD LOSE TRACK OF THE REGISTER VALUES, SAVE THE CURRENT TEXT EDITOR DATA ON TAPE. TURN OFF THE AIM THERMAL PRINTER. RELOAD THE FIRST DATA SECTION FROM TAPE. RUN MERGE, WITH THE OUTPUT GOING TO THE DISPLAY ONLY, UP TO THE POINT WHERE YOU ARE. KEEP TRACK OF THE REGISTERS AS YOU GO.

ONCE YOU HAVE GOT THE PRESENT SECTION CORRECT AND HAVE RUN A GOOD PROOF, SAVE IT ON TAPE. IF THERE IS MORE TO DO, JUMP BACK TO INSTRUCTION 11-A AND DO THE NEXT SECTION. OTHERWISE, GO ON TO 11-H.

H. ALL THAT REMAINS TO DO NOW IS TO CUT OUT THE EXTRANEOUS LINES THAT ARE PRINTED EACH TIME MERGE IS RE-ENTERED WITH THE "F1" (C) KEY. THERE WILL BE A "TITLE LINE" AND AN "ASTRIX LINE" PRINTED ALONG WITH A FEW BLANK LINES THAT YOU DON'T WANT. CUT THE LISTING JUST ABOVE THE FIRST GOOD LINE OF THE SECTION. MOVE THE LISTING UP SO THE FIRST GOOD LINE IS JUST AFTER THE LAST GOOD LINE AND TAPE OR PASTE THE SECTIONED LISTING BACK TOGETHER. IF YOU HAVE DONE IT CORRECTLY, THE CONTINUITY OF THE PAGING WILL HAVE BEEN RESTORED. MARK OFF THE CUT LINES FOR ALL OF THE PAGES IN THE LISTING AND CUT THEM. I USE THE CARDBOARD BACKING FROM AN 8 1/2" X 11" TABLET AS A TEMPLATE WHEN MARKING THE PAGES OFF. ONCE YOU GET THE TOP MARGIN SET ON THE FIRST PAGE, THE REST OF THE PAGES FALL RIGHT INTO PLACE.

13. WHILE THIS HAS PROBABLY BEEN CONFUSING TO READ THROUGH, THE ENTIRE OPERATION IS EASY TO GET USED TO. READ THROUGH IT AGAIN WHILE DOING THE STEP BY STEP DOCUMENTATION FOR YOUR FAVORITE PROGRAM. DISREGARD ANY QUOTATION MARKS (") SHOWN IN THESE OPERATING INSTRUCTIONS. THEY ARE SHOWN HERE TO EMPHASIZE ON SEPARATE THE VARIOUS FORMATS TO USE. THEY ARE NOT A PART OF ANY COMMAND OR ENTRY PROCEDURE. ONCE YOU HAVE USED MERGE, IT WILL ALL BECOME CLEAR TO YOU. AFTER YOU HAVE MADE YOUR FINAL LISTING, WRITE UP A SHORT COVER STORY AND MAIL IT WITH YOUR PROGRAM TO YOUR FAVORITE PUBLISHER.

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Introducing the Atari 800

Perhaps you have heard about the Atari, or maybe even have seen it's picture in the Sears Roebuck Catalog! Here are the basic facts about this latest addition to the expanding 6502 microcomputer world.

William L. Colsher

The model 800 computer is Atari's "top of the line" personal computer. Included in the \$999.95 list price are the Atari 410 cassette program recorder, an 8K BASIC in a removable ROM cartridge, an Educational System ROM cartridge, the 332 page Atari BASIC book by Albrecht, Finkel and Brown, and several other small manuals. Though it was not yet ready when my system was delivered, buyers should now be getting a short CAI course called "An Invitation to Programming". This, along with the Atari BASIC book should bring the beginner up to speed pretty quickly.

The model 400 includes everything except the program recorder and Educational System cartridge for \$599.95. It is functionally identical with the 800 but with the following differences: the keyboard is a flat 'elastomer' type keyboard, the memory can be expanded only to 16K (and that requires a visit to the shop) and the only peripheral you can use (other than game controllers) is the 410 program recorder.

Atari has several peripherals available now including the 810 disk drive at \$699.95, the 820 printer and \$599.95 and an assortment of game controllers. Announced but with no prices as yet are the 825 printer (apparently a Centronics 730), the 830 modem which looks just like a Novation CAT modem, and the 850 Interface Module which features four RS232 ports and a Centronics port so you can use the 825 printer. One of the RS 232 ports also supports 20 mA current loop so you can use it with a teletype.

Color graphics are one of the Atari's strong points. There are eight different modes each of which

can operate in several different ways— it is complicated but very flexible. Graphic resolution is from 39 x 20 all the way up to 320 x 192. In all modes but the last you can have up to 4 colors on the screen at a time. (Three colors for the graphics points plus a background color.) In addition to the color, you can also control something called luminance. This is roughly like an artist adding white to another color. For example, you can get red in any shade from very pale pink to a dark, bloody shade (great for D&D).

The Atari computers also include an excellent sound system: four separate voices with individual tone and volume control. The frequencies range from about an octave below middle C to just barely audible at the high end.

Since it had to fit into 8K of ROM, Atari BASIC is smallish but quite adequate. The only major things missing are the string intrinsics and some of the convenience items like automatic line numbering when you are entering programs and line renumbering.

The lack of convenience features is pretty well made up for by Atari's *super* screen editor. Basically, if it's on the screen and you change it, it's changed in memory. To make a program change just LIST the line and stick in the changes on the screen. That's all there is to it. Various function keys make it easy to insert and delete spaces and even entire lines. Ofcourse there are the usual cursor control keys for moving around on the screen.

While we are on the subject of the keyboard, I'll point out that someone inside Atari's development team seems to have thought of just

about everything. Included are all the usual keys as well as CTRL and ESC. You have control of the keyboard graphics symbols, upper and lower case, and normal and reverse video. The only thing missing from the 800's keyboard are the graphic symbols which are printed on the 400's. Perhaps someone will come out with a set of stickers (are you there, Atari?).

In terms of software, Atari seems to be doing pretty well. There is a definite emphasis on education with 17 packages in a wide range of subjects. ROM cartridges are also big with 11 available. I've mentioned two that come with the 800; also in the catalog are an Assembler, Chess, Star Raiders (an absolutely fantastic game) and a number of other. If all the games are as great as Star Raiders, then they are well worth the prices Atari charges— I've easily saved \$59.95 in quarters (I'm an arcade game freak).

Other companies with software for the Atari machines are The Code Works which publishes IRIDIS (the first issue is available now) and Image Computer Products. Sears, Roebuck Co. has eight cassettes listed in their current catalog as well. (The idea of 'Sears Software' is a bit of a shock at first!)

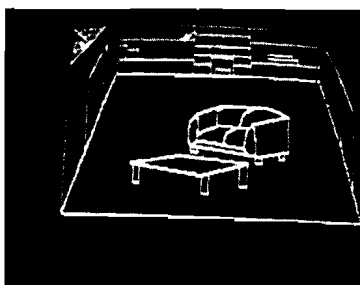
I think the Atari machines are a good buy with quite a future ahead. The 800 is as versatile as any other machine in its price range, comparable to the Apple II and easily outdistancing the TRS-80 (I have a 48K dual disk "—80" as well). With companies like Sears getting into the personal computer game, we are probably in for something of a revolution. And Atari should be in the front lines.

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ALL NEW

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In this particular HI-RES ADVENTURE game, you are transported to the front yard of a large, old victorian house. When you enter the house you are pulled into the mystery, murder, and intrigue and can not leave until you solve the puzzles. Your friends are being murdered one by one. You must find out why, and who the killer is. Be careful, because the killer may find you! As you explore the house there are puzzles to be solved and hazards to overcome. The secret passage-way may lead you to the answer.

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SKEET/TRAP have become Olympic shooting sports and and obsession among Scatter-gunners all over the world. These games are the All-American although they have become international.

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TRAPSHOOT allows one to five shotgunners to test their markmanship. The trap firing range has five positions where the one to five players shoot from. Each player is at a different location on the field. The challenge is to shoot pigeons out of the sky which launch at random trajectories. The challenge is to hit the pigeons while they are still in gun range.

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APPLE II Integer BASIC Program

List by Page

A number of programs have been written which solve the Apple's problem of examining a program on the display. This version permits the user to simply view his program page-by-page.

Dave Partyka

If you own an Apple II, I'm sure you feel there could be a better way to list a program. The way it is now you either list the whole program and watch it go by faster than you can read it, or you list it by line numbers. When you list it by line numbers, you may get two lines or you may get more lines than will fit on the screen.

Using the assembler program listed, and the integer basic of the Apple II, you can list your integer basic programs one page(screen) at a time with a page number at the bottom of each. Pressing just about any key (except B, P, or S) will clear the screen and display the next page adding one to the page number. By pressing keys you display your program a page at a time, with no more two lines here or too many lines there.

You are probably wondering why you can't use the B, P, or S keys. These are special function keys. The B key (for beginning) will clear the screen and display your program from the first page. This comes in handy when you're in the middle or near the end of the display and you want to see some subroutines or anything else at the beginning. Just press the B key and you are at the beginning, ready to start over.

The next key, P (for page) will clear the screen and start displaying your program stopping at the page number you keyed in. For example, if you are at page 25 and you want to back up 2 pages, you press P0023. P will clear the screen and the APPLE

APPLE II INTEGER BASIC PROGRAM LIST BY PAGE

300	A9 22	LDA #22	LOAD BEGINNING
302	85 36	STA 36	ADDRESS OF MAIN
304	A9 03	LDA #03	PROGRAM IN USER
306	85 37	STA 37	OUTPUT LOCATIONS.
308	20 E6 03	JSR 3E6	LOAD HIGH VALUES.
30B	A9 00	LDA #00	MOVE ZEROS TO
30D	8D F4 03	STA 3F4	PAGE COUNT
310	8D F5 03	STA 3F5	LOCATIONS.
313	20 58 FC	JSR FC58	CLEAR SCREEN.
316	20 4B E0	JSR E04B	START BASIC LIST.
319	20 96 03	JSR 396	ADD 1 TO PAGE #.
31C	20 E6 03	JSR 3E6	LOAD PAGE HOLD WITH FF.
31F	4C 03 E0	JMP E003	RETURN TO BASIC CONTROL.
322	48	PHA	SAVE ACCUM. AND IND=Y
323	98	TYA	VALUES BEFORE PRINTING
324	48	PHA	ON THE SCREEN.
325	A5 28	LDA 28	CHECK SCREEN ADDRESS
327	45 29	EOR 29	FOR 07 DO THE
329	C9 D7	CMP #D7	24TH LINE.
32B	D0 54	BNE .381	IF NOT = BRANCH.
32D	20 96 03	JSR 396	ADD 1 TO PAGE #.
330	AD F6 03	LDA 3F6	CHECK PAGE HOLD,
333	C9 FF	CMP #FF	IF = FF THEN THE P
335	F0 19	BEQ 350	KEY WASN'T PRESSED.
337	AD F4 03	LDA 3F4	COMPARE PAGE #
33A	CD F6 03	CMP 3F6	WITH PAGE HOLD,
33D	D0 08	BNE 347	IF EQUAL
33F	AD F5 03	LDA 3F5	BRANCH TO THE

will beep as you key in the four digits. You have to enter four digits so the leading zeros are necessary. After the last digit is pressed, your program will be displayed from the beginning, stopping at page 23. This is faster than pressing the B key and other ones until you get to page 23.

The last key, S (for Stop) gets you out of the list program and back to the APPLE II basic. This key is used when you find a place in your program where you want to add or delete a line. If you don't press the S key and you try to do anything, as soon as you press a key the next page will be displayed.

There are two ways to activate this program. From monitor press CTRL Y then the RETURN key or from basic type CALL 1016 then press the RETURN key. As long as you don't use the area from hex 300 to 3FF, this program will remain in memory. Once the list program is activated, it is entered only when the screen display reaches the bottom of the screen. If the end of your program ends anywhere but the bottom of the screen, the Apple II will return to basic but the list program will still be activated. To deactivate the list program, type CALL 1016 then press the RETURN key, then press the S key for stop, or press the RETURN key to skip to the bottom of the page and press the S key to stop.

If you ran a basic program and the list program is still activated, then the results you get will depend on your program. Some programs won't be affected at all while others will stop if it has a display that reaches the bottom of the screen. Pressing a key will start the program again. Other programs might be able to make use of this assembler routine by stopping the display at the bottom of the screen.

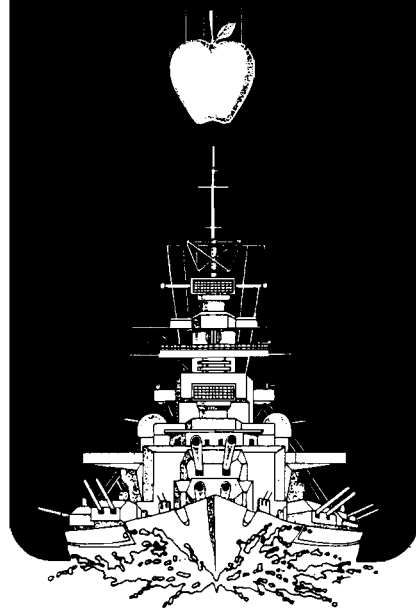
Using this assembler program, you'll find it easier to de-bug your programs or just follow the flow of any program. μ

Dave Partyka works as a programmer on an IBM 3031 OS system for the May dept. store company. He has been programming for 3 years, and he has been an operator for 4 years prior to that. Before he began work at the May company he served 4 years in the US Navy where he worked in data processing.

342	CD F7 03	CMP 3F7	LOOP ROUTINE
345	FO 06	BEQ 34D	ELSE
347	20 58 FC	JSR FC58	CLEAR SCREEN
34A	4C 81 03	JMP 381	CONTINUE PRINTING.
34D	20 E6 03	JSR 3E6	LOAD PAGE HOLD WITH FF.
350	2C 00 C0	BIT C000	LOOP UNTIL A
353	10 FB	BPL 350	KEY IS PRESSED.
355	AD 00 C0	LDA C000	WHEN KEY IS PRESSED
358	8D 10 C0	STA C010	CLEAR KEY STROBE
35B	C9 D3	CMP #D3	AND COMPARE FOR S.
35D	D0 0B	BNE 36A	IF NOT = BRANCH.
35F	A9 F0	LDA #F0	IF S STORE
361	85 36	STA 36	NORMAL ADDRESS
363	A9 FD	LDA #FD	IN THE USER
365	85 37	STA 37	OUTPUT LOCATIONS.
367	4C 03 E0	JMP E003	RETURN TO BASIC CONTROL.
36A	C9 C2	CMP #C2	B KEY PRESSED?
36C	FO 9A	BEQ 308	IF YES BRANCH.
36E	C9 D0	CMP #D0	F KEY PRESSED?
370	D0 0C	BNE 37E	IF NO BRANCH.
372	A2 00	LDX #00	IF YES THEN GET
374	20 CF 03	JSR 3CF	2 DIGITS OF PAGE #.
377	E8	INX	UP INDEX AND
378	20 D2 03	JSR 3D2	GET NEXT TWO DIGITS.
37B	4C 0B 03	JMP 30B	JUMP TO ZERO PAGE #.
37E	20 58 FC	JSR FC58	CLEAR SCREEN.
381	68	PLA	GET ACCUM. AND IND-Y
382	A8	TAY	FROM THE STACK
383	68	PLA	AND JUMP TO THE
384	4C FO FD	JMP FDF0	DISPLAY ROUTINE.
387	A8	TAY	SAVE ACCUM. AND
388	29 OF	AND #OF	CONVERT LOW ORDER
38A	09 B0	ORA #B0	BYTE TO DECIMAL AND
38C	9D F4 07	STA 7F4,X	PRINT PAGE #.
38F	98	TYA	GET ACCUM. AND
390	6A	ROR	ROTATE
391	6A	ROR	HIGH ORDER
392	6A	ROR	BYTE TO THE
393	6A	ROR	LOW ORDER
394	CA	DEX	BYTE AND
395	60	RTS	RETURN.
396	F8	SED	SET DECIMAL MODE.
397	18	CLC	CLEAR CARRY FLAG.
398	AD F5 03	LDA 3F5	ADD
39B	69 01	ADC #01	1
39D	8D F5 03	STA 3F5	TO
3A0	AD F4 03	LDA 3F4	THE
3A3	69 00	ADC #00	PAGE

3A5	8D F4 03	STA 3F4	NUMBER.
3A8	D8	CLD	CLEAR DECIMAL MODE.
3A9	A2 03	LDX #03	SET IND-X.
3AB	AD F5 03	LDA 3F5	GET PAGE # LOW.
3AE	20 87 03	JSR 387	PRINT 1ST DIGIT.
3B1	20 87 03	JSR 387	PRINT 2ND DIGIT.
3B4	AD F4 03	LDA 3F4	GET PAGE # HIGH.
3B7	20 87 03	JSR 387	PRINT 3RD DIGIT.
3BA	20 87 03	JSR 387	PRINT 4TH DIGIT.
3BD	60	RTS	RETURN.
3BE	2C 00 C0	BIT C000	LOOP UNTIL A
3C1	10 FB	BPL 3BE	KEY IS PRESSED.
3C3	20 DD FB	JSR FBDD	RING BELL
3C6	AD 00 C0	LDA C000	GET KEY
3C9	8D 10 C0	STA C010	CLEAR STROBE
3CC	29 0F	AND #0F	DROP HIGH ORDER
3CE	60	RTS	HALF AND RETURN.
3CF	20 58 FC	JSR FC58	CLEAR SCREEN.
3D2	20 BE 03	JSR 3BE	GET PAGE #.
3D5	0A	ASL	SHIFT LOW ORDER
3D6	0A	ASL	HALF TO THE
3D7	0A	ASL	HIGH ORDER
3D8	0A	ASL	HALF.
3D9	9D F6 03	STA 3F6,X	STORE IN PAGE HOLD.
3DC	20 BE 03	JSR 3BE	GET NEXT NUMBER.
3DF	5D F6 03	EOR 3F6,X	COMBINE WITH
3E2	9D F6 03	STA 3F6,X	PREVIOUS # AND STORE
3E5	60	RTS	IN PAGE HOLD, RETURN.
3E6	A9 FF	LDA #FF	PUT HIGH VALUES
3E8	8D F6 03	STA 3F6	IN PAGE HOLD
3EB	8D F7 03	STA 3F7	LOCATIONS THEN
3EE	60	RTS	RETURN.
3EF	00	BRK	
3F0	00	BRK	
3F1	00	BRK	
3F2	00	BRK	
3F3	00	BRK	
3F4	00	BRK	PAGE # HIGH
3F5	00	BRK	PAGE # LOW
3F6	00	BRK	PAGE HOLD HIGH
3F7	00	BRK	PAGE HOLD LOW
3F8	4C 00 03	JMP 300	CTRL-Y ENTERS HERE
3FB	00	BRK	
3FC	00	BRK	
3FD	00	BRK	
3FE	00	BRK	
3FF	00	BRK	

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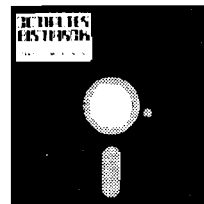
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OHIO SCIENTIFIC'S

Welcome to the Ohio Scientific Small Systems Journal. This is the first issue of a continuing monthly feature in Micro.

The Small Systems Journal will, hopefully, serve two major purposes. The first is to expand and enhance the knowledge of Ohio Scientific's systems for those of you who already own or use an Ohio Scientific computer. The second is to introduce non-OSI users to some of the systems.

We will try to maintain a balance in the Journal of technical and nontechnical articles, with both hardware and software features. This issue covers three topics:

Simple Modem Routine for C4P MF and C8P DF
User Modifiable I/O for the C1P
The UTI — Universal Telephone Interface

In future issues we hope to cover the topics of interest to the most people. To this end we invite suggestions, on article content, to be submitted to:

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Small Systems Journal
1333 S. Chillicothe Road
Aurora, Ohio 44202

CUSTOMIZING C1P BASIC-in-ROM I/O

One little known feature of Ohio Scientific's Challenger 1P computer is that the input and output (I/O) routines for ROM BASIC are user modifiable. This is made possible by the jump (JMP) indirect feature of the 6502 processor.

For example, when BASIC requires a character to be input, it executes the following subroutine call:

```
XXX 20EBFF JSR BASIN
```

The actual input routine is called via indirection of the INVCT (in vector) register pair (hex 0218 and 0219).

This means that the processor instead of executing a "normal" jump (ie., JMP destination) fetches the data contained in the indirct register pair (218 and 219 in this case) and uses those 16 data bits as the address of the jump's destination. The net effect is that BASIC's input call is handled by a machine code subroutine whose address is stored at (hex) locations 218 and 219.

All of BASIC's input call is handled in this fashion. The following table gives the address of each routine and the related register pair:

TABLE 1

Routine	Address	Register-Pair	Function
BASIN	FFEB	218, 219	Get character input in accumulator
BASOUT	FFEE	21A, 21B	Output character in accumulator
CNTRLC	FFF1	21C, 21D	Check CONTROL-C in accumulator

```
BLOAD FFF4 21E, 21F BASIC LOAD
BSAVE FFF7 220,221 keyword
keyword BASIC SAVE
keyword
```

By studying Table 1, it may be seen that although the C1P BASIC is in ROM and that BASIC I/O calls are in ROM, the actual addresses of the I/O routines are in RAM.

When the C1P is reset, the five indirect register pairs are initialized with routine addresses contained in the BASIC support ROM. However, after starting BASIC, these addresses may be changed to point to custom routines with appropriate POKE's.

The following is an example of one of many possible user created routines. This one offers a modification to BASIC's input routine.

Normally, when an input character is deleted (with shift-0), BASIC responds by removing the character from it's input buffer and reoutputting the cursor. The routine in Listing 1 removes the character from both the buffer and the CRT display.

LISTING 1

```
10 ;
20 ;SIMPLE 1P CHAR DELETE
30 ;
40 ;
50 0222 *=$222
60 ;
70 0222 2000FD KEYIN JSR $FD00 GET KEY
80 0225 C95F CMP #$5F SHIFT 0?
90 0227 F001 BEQ *+3 YES
100 0229 60 RTS NO. SEND CHAR TO BASIC
110 ;
120 022A 8A TXA SAVE X
130 022B 48 PHA
140 022C A920 LDA #$20 SPACE IN A
150 022E AE0002 LDX $200 GET CRT INDEX
160 0231 20CDBF JSR $BCDD REMOVE CURSOR
170 0234 CA DEX ADJ INDEX
180 0235 20CDBF JSR $BCDD REMOVE LAST CHAR
190 0238 BE0002 STX $200 SAVE NEW CRT INDEX
200 023B 68 PLA
210 023C AA TAX RESTORE X
220 023D CA DEX ADJ BASIC'S BUFFER INDEX
230 023E 4C2202 JMP $222 GET ANOTHER CHAR
240 ;
250 .END
```

The first listing is assembled at (hex) 222 and occupies a small portion of the free RAM space from 222 through 2FA.

The overall operation of the routine is as follows:

- 1) A character is read from the keyboard and if it's not shift-0, simply return to BASIC.
- 2) If shift-0 is received, both the current cursor position and the previous character position are removed from the screen.
- 3) BASIC's buffer index is decremented and another character is input.

Note that within the routine, the original contents of the X-register (BASIC's buffer index) is saved. Generally speaking, the original contents of all processor registers (except the accumulator in BASIN and CNTRLC course) should be protected when interfacing to BASIC.

SMALL SYSTEMS JOURNAL

Listing 2 demonstrates a typical method for overlaying the code via BASIC.

LISTING 2

```
10 REM
20 REM SIMPLE 1P CHARACTER DELETE
30 REM
40 REM 6502 CODE
50 DATA 32,0,253
55 DATA 201,95,240,1,96
60 DATA 138,72,169,32
65 DATA 174,0,2
70 DATA 32,205,191
75 DATA 202,32,205,191
80 DATA 142,0,2
85 DATA 104,170
90 DATA 202,76,34,2
100 REM
110 REM SET-UP 6502 CODE
120 FOR I=0 TO 30
130 READ D
140 POKE 546+I,D
150 NEXT I
200 REM
210 REM OVERLAY NEW INPUT VECTOR
220 POKE 536,34
230 POKE 537,2
999 END
```

The DATA statements in lines 50 through 90 contain the decimal equivalent of the hexadecimal numbers in the assembly code. That is, the (hex) bytes 20,00,FD equal the decimal 32,0,253; etc. Lines 120 through 150 POKE the code into thirty-one consecutive locations starting at decimal 546 (hex 0222).

The final statements, line 220 and 230, enable the use of the routine by changing the address at the input indirect register pair 536, 537, (hex 218, 219). Note that the address POKEd into this register pair is low, high order. This means that (hex) address 0222 is actually represented in memory thusly:

```
0218 contains 22
0219 contains 02
```

This format is typical for all 6502 indirect addressing schemes.

After the routine has been loaded, it should never be necessary to reload it. This of course assumes power is not interrupted and the routine is not over written. Remember, however, that the original input vector is rewritten on reset. To reimplement this routine after reset, only BASIC lines 220 and 230 need be re-executed.

Note, if done in the immediate mode, be sure to execute both POKE's on one line:

```
POKE 536,34: POKE 537,2
```

If not, the input vector will not point to either routine and

an error will surely occur.

As this routine is intended primarily as a demonstration of an interfacing method, not a field upgrade, there are a couple of limitations that could be overcome by additional code:

- 1) The cassette I/O is no longer polled on input. This means that LOAD function is essentially disabled. This is easily overcome by a reset and Warm Start.
- 2) No check of BASIC's buffer index is done. It's possible to delete past the beginning of a line. To delete an entire line, shift-P should be used.

A hint to fix problem #2; never let 'X' (line 220 of the assembly code) go below zero.

By following this general example, you should be able to implement several interesting I/O routines. One suggestion might be to try a memory I/O in parallel with the normal I/O. Remember, in addition to the 216 bytes (decimal) available from (hex) 222 through 2 FA, areas of "upper" memory may also be reserved when responding to MEMORY SIZE? at Cold Start.

Modem Routine for C4P MF and C8P DF

With non-prime time rates becoming available on large time sharing systems, a modem is rapidly becoming a very useful addition to a home computer system.

The following program is designed for use with a standard modem (with RS-232) and an Ohio Scientific C4P MF or C8P DF computer.

The routine is essentially a "bare-bones" system which allows your computer to be used as a terminal for the timeshare system accessed. This program may certainly be expanded to whatever terminal intelligence you may require.

List of Control Commands

CONTROL-S — Stop print
CONTROL-Q — Re-start print (use with CNTRL-S)
CONTROL-D — Toggle duplex mode between Full and Half
CONTROL-E — Toggle Auto-Echo (enable/disable)
CONTROL-B — Return to subroutine caller

The program is a subroutine that may be called by BASIC via the USR function. Note, in this case, CONTROL-B will cause a return to BASIC.

This program is assembled to operate under OS-65D V3.2 Home Control Operating System.

MODEM ROUTINE FOR C4P MF AND C8P DF

```
10 4000      *=$4000
20
30 2599=     CRTOUT=$2599
40 2AC5=     DEFAUL=$2AC5
50 3180=     KBDIN=$3180
60 2644=     KESWAP=$2644
70 267A=     MRKT=$267A
80 2343=     OUTCH=$2343
90 2322=     OUTFLG=$2322
100 00E5=    SFLAG=$00E5
110 24CD=    TTYOUT=$24CD
120
121 4000 A934      LDA $52      SET MODEM PORT
122 4002 8D03F7    STA 63235    THATS DECIMAL FOLKS
123 4005 A902      LDA $02      SELECT 300 BAUD
124 4007 8D00FC    STA $FC00
```


OHIO SCIENTIFIC'S

130 400A AD2223	LDA OUTFLG	GET SELECTED DEVICE	910			
140 400D 202C41	JSR PRINTR	SET UP OUTPUT FOR DEVICES SELECTED	920 40A4 AD2223	SERIAL	LDA OUTFLG	SEE WHAT DEVICES WE HAVE
150			930 40A7 C901	CMP #1		SERIAL ?
160 4010 ADC62A	LDA DEFAULT+1	GET DEFAULT DEVICE	940 40A9 F0C3	BEQ AHRTS		YES, DON'T TURN ON SERIAL PNTR
170 4013 C902	CMP #2	IS IT VIDEO?	950 40AB 4901	EOR #1		NO, CHANGE OUTPUT FLAG
180 4015 F014	BEQ START	YES, CODE IS OKAY START EXECUTION	960 40AD 202C41	JSR PRINTR		GO CHANGE CODE TO SUPPORT CONDITIONS
190			970 40B0 A900	LDA #0		CLEAR A
200 4017 A940	LDA #KBSERL/256		980 40B2 60	RTS		ALL DONE
210 4019 8D4840	STA KEY+2	SET UP I/O FOR A	990			
220 401C A9CB	LDA #KBSERL	SERIAL TERMINAL	1000 40B3 ADCA40	FLPECO	LDA AUTOEC	CHANGE AUTO ECHO FLAG
230 401E 8D4940	STA KEY+1		1010 40B6 4901	EOR #1		ENABLE/DISABLE
240 4021 A924	LDA #TTYOUT/256		1020 40B8 8DCA40	STA AUTOEC		
250 4823 8D5A40	STA KBD1+2		1030 40BB A900	LDA #0		
260 4826 A9CD	LDA #TTYOUT		1040 40BD 60	RTS		
270 4028 8D5940	STA KBD1+1		1050			
280			1060 40BE ADC940	FLPDUP	LDA DUPLEX	CHANGE DUPLEX FLAG
290 402B 204426	START JSR KBSWAP	DO A SWAP IN CASE KBD POLLED	1070 40C1 4901	EOR #1		ENABLE/DISABLE
300			1080 40C3 8DC940	STA DUPLEX		
310			1090 40C6 A900	LDA #0		
315 402E=	P1=*		1100 40C8 60	RTS		
320 402E AD00FC	MOREAD LDA \$FC00	READ THE MODEM?	1110			
330 4031 4A	LSR A	IS THERE A BYTE READY?	1120 40C9 00	DUPLEX .BYTE 0		DUPLEX FLAG
340 4032 9011	BCC KDYBRD	NO. CHECK KBRD FOR INPUT	1130 40CA 00	AUTOEC .BYTE 0		AUTO ECHO FLAG
350 4034 AD01FC	MODMIN LDA \$FC01	YES, GET THE BYTE	1140			
360 4037 ACCA40	LDY AUTOEC	CHK AUTO ECHO ?	1150 40CB AD00FC	KBSERL LDA \$FC00		SERIAL KEYBOARD INPUT ROUTINE
370 403A F003	BEQ OUTCHR	NO. OUTPUT CHAR	1160 40CE 4A	LSR A		
380 403C 206240	JSR MOWRIT	YES, ECHO IT TO THE MODEM	1170 40CF A900	LDA #0		
390 403F 20F940	OUTCHR JSR CHECK	CHK IF STOP PRINT NEEDED OVER MODEM	1180 40D1 9003	BCC KBSER1		
400 4042 204323	JSR OUTCH	OUTPUT CHAR	1190 40D3 AD01FC	LDA \$FC01		
410			1200 40D6 60	KBSER1 RTS		
420 4045 20D740	KEYBRD JSR CHECKS	CHK IF START PRINT NEEDED OVER MODEM	1210			
430 4048 208031	KEY JSR KBDIN	GO GET ANY KEYS DEPRESSED	1220 40D7 A5E5	CHECKS LDA SFLAG		LOAD STOP PRINT FLAG
440 404B F0E1	BEQ P1	NO KEYS. START LOOP OVER	1230 40D9 CD0341	CMP CTRLS+2		HAS A STOP PRINT BEEN SENT ?
450 404D 206F40	JSR KEYCHK	CHK FOR ANY SPECIAL KEYS	1240 40DC D01A	BNE OUT2		NO, RETURN
460 4050 F0DC	BEQ P1	YES, ONE EXECUTED	1250 40DE AE4841	LDX COUNT		YES, IS THERE ANY CHR IN BUFFER
470 4052 ACC940	KBD LDY DUPLEX	DUPLEX FLAG SET	1260 40E1 F00E	BEQ CTRLQ		NO, SEND START PRINT CODE
480 4055 F005	BEQ KBD2	NO. WRITE CHAR TO MODEM	1270 40E3 A000	LDY #0		YES, GET CHR OUT OF BUFFER
490 4057 48	PHA	YES	1280 40E5 B94C41	LOOPER LDA BUFFER,Y		
500 405B 209925	KBD1 JSR CRTOUT	OUTPUT CHR AT LOCAL TERMINAL FIRST	1290 40E8 204323	JSR OUTCH		SHOW WHAT WE HAVE
510 405B 68	PLA	RESTORE A	1300 40EB C8	INX		
520 405C 206240	KBD2 JSR MOWRIT	WRITE KEY DEPRESSION TO MODEM	1310 40EC CC4841	CPY COUNT		IS THAT ALL ?
530 405F 4C2E40	JMP P1	START LOOP OVER	1320 40EF D0F4	BNE LOOPER		NO, GET NEXT ONE
540			1330 40F1 A911	CTRLQ LDA #'Q-\$40		YES, SEND START PRINT COMMAND
550 4062 48	MOWRIT PHA	SAVE A	1340 40F3 85E5	STA SFLAG		RESET FLAG
560 4063 AD00FC	LDA \$FC00	WAIT FOR READY TO SEND	1350 40F5 206240	JSR MOWRIT		
570 4066 4A	LSR A		1360 40F8 60	OUT2 RTS		ALL DONE
580 4067 4A	LSR A	READY?	1370			
590 4068 90F9	BCC MOWRIT+1	NO. CHK AGAIN	1380 40F9 C90D	CHECK CMP #\$0D		IS CHAR A CRT OR LF ?
600 406A 68	PLA	YES, RESTORE A	1390 40FB F004	BEQ CTRLS		IF YES, SEND STOP PRINT
610 406B 8D01FC	STA \$FC01	SEND BYTE	1400 40FD C90A	CMP #\$0A		IF NOT, RETURN
620 406E 60	AHRTS RTS	ALL DONE	1410 40FF D02A	BNE OUT		
630			1420 4101 48	CTRLS PHA		SAVE A
640 406F C902	KEYCHK CMP #'B-\$40	CTRL-B ? (HANG UP PHONE)	1430 4102 A913	LDA #'S-\$40		
650 4071 F01F	BEQ GOODBY	YES, HANG UP AND RETURN	1440 4104 85E5	STA SFLAG		SET FLAG
660 4073 C904	CMP #'D-\$40	CTRL-D ? (DUPLEX E/D)	1450 4106 206240	JSR MOWRIT		SEND STOP PRINT CODE
670 4075 F047	BEQ FLPDUP	YES, CHANGE FLAG	1460 4109 A200	LDX #0		
680 4077 C905	CMP #'D-\$40	CTRL-E ? (AUTO ECHO E/D)	1470 410B 8E4841	STX COUNT		SET # IN BUFFER TO 0
690 4079 F038	BEQ FLPECO	YES, CHANGE FLAG	1480 410E AC7B26	LOOPY LDY MRKT+1		WAIT 4 CHR TIME FOR ANY CHAR
700 4079 C919	CMP #'Y-\$40	CTRL-Y ? (SERIAL PRINTER E/D)	1490 4111 AD00FC	BEGIN LDA \$FC00		STILL COMING
750 4083 AD2223	PARALL LDA OUTFLG	YES, SEE WHAT DEVICES WE HAVE	1500 4114 4A	LSR A		IS THERE A CHR WAITING ?
760 4086 C902	CMP #2	VIDEO ?	1510 4115 9007	BCC LOOP49		NO, CONTINUE WAIT
770 4088 F0E4	BEQ AHRTS	YES, DON'T TURN ON PARL PNTR	1520 4117 AD01FC	LDA \$FC01		YES, SAVE CHARACTER
780 408A 4908	EOR #8	NO, CHANGE OUTPUT FLAG	1530 411A 9D4C41	STA BUFFER,X		
790 408C 202C41	JSR PRINTR	GO CHANGE CODE TO SUPPORT CONDITIONS	1540 411D E8	INX		NEXT ?
800 408F A900	LDA #0	CLEAR A	1550 411E 18	LOOP49 CLC		
810 4091 60	RTS	ALL DONE	1560 411F 88	DEY		
820			1570 4120 D0EF	BNE BEGIN		LOOP AGAIN
83C 4092 68	GOODBY PLA	RETURN TO THE RIGHT PLACE	1580 4122 EE4841	INC COUNT		DONE ?
84C 4093 68	PLA		1590 4125 D0E7	BNE LOOPY		NO, TRY AGAIN
850 4094 ADC62A	LDA DEFAULT+1	SET BACK TO DEVICES	1600 4127 8E4841	STX COUNT		SAVE # OF CHRS IN BUFFER
860 4097 8D2223	STA OUTFLG	WE STARTED WITH	1610 412A 68	PLA		RESTORE A
870 409A ADF240	LDA CTRLQ+1	SEND START PRINT JUST IN CASE	1620 412B 60	OUT RTS		
880 409D 206240	JSR MOWRIT		1630			
890 40A0 204426	JSR KBSWAP	RETURN POLLED KEYBOARD	1640 412C 8D2223	PRINTR STA OUTFLG		SAVE DEVICES SELECTED
900 40A3 60	RTS	RETURN TO CALLER	1650 412F C909	CMP #9		IS EITHER PRINTER TURNED ON ?
			1660 4131 F00D	BEQ PRTEA		YES, ENABLE PRINT START & STOP
			1670 4133 C903	CMP #3		
			1680 4135 F009	BEQ PRTEA		YES, ENABLE PRINT START & STOP
			1690 4137 A960	PRTDIS LDA #\$60		NO, DISABLE PRINT START & STOP
			1700 4139 8DD740	STA CHECKS		

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```

1710 413C 8DF940    STA CHECK
1720 413F 60        RTS          RETURN
1730 4140 A9A5      PRTEA LDA #A5
1740 4142 8DD740    STA CHECKS
1750 4145 A9C9      LDA #C9
1760 4147 8DF940    STA CHECK
1770 414A 60        RTS          ALL DONE
1780                ;
1790                ;
1800 414B 00        COUNT .BYTE 0    COUNTER BYTE
1810                ;
1820 414C-          BUFFER=*    BUFFER FOR INCOMING CHRS
    
```

CA-15 Universal Telephone Interface

The Universal Telephone Interface (UTI) provides the broadest range of computer/telephone utilization options ever offered in a single product. The UTI occupies one slot of a C8P, C2-OEM or C3 series computer and connects directly to a normal telephone line via a FCC approved isolation module called a CBT. CBT's are available from many telephone companies on a monthly charge basis. However, Ohio Scientific also offers CBT's as a accessory item for user connection to telephone lines. The UTI can be connected in conjunction with one or more telephones on the line and can also operate as the only device on the line. No user intervention is required to initiate or answer calls. (i.e., total computer control is possible) The UTI compatible with Touch Tone or Pulse Dial (rotary dial) lines.

The UTI includes a computer to telephone interface which allows the user (through software) to "connect" (pick up) and "disconnect" (hang up) the phone. The computer can detect a dial tone before dialing. Note, again this may be either pulse or tone dialing. After dialing a phone number, it can detect a ring on incoming calls. Additionally, the UTI includes a failsafe circuit which automatically hangs up the phone after 90 seconds of inactivity. This prevents accidental extended connection to the phone line.

The UTI allows any one of five different audio signals to be output to the phone line at any one time. These five signals are touch tones, taped messages, audio from an auxiliary device, modem signals and Votrax generated synthetic speech (when equipped with the Votrax option). Touch tones can be output to the phone at any time. This allows the computer to tone dial the phone, or to signal humans or other computers.

The UTI can output taped messages to the phone from cassette tape recorders. The tape recorder can be automatically turned off and on with a motor control signal which is provided by the UTI.

Audio from a digital-to-analog converter, radio or other auxiliary device can be selected for output to the phone line through the auxiliary jack on the UTI.

The "on board" modem outputs 300 baud data to the phone. The modem features "originate" or "answer" modes.

Votrax equipped UTI's can output Votrax generated synthetic speech to the phone. The UTI contains an "on board" amplifier which will drive an 8 ohm speaker with Votrax speech. This allows the Votrax to also be operated in a "stand alone" mode.

Input from the phone can include voice, touch tones, and modem signals. Voices can be routed to an audio amplifier via the UTI auxiliary audio output connector and/or to an auxiliary cassette tape recorder which can be automatically turned off and on with a motor control signal which is provided by the UTI. Touch tones can be decoded by the UTI. This allows remote control of your computer via touch tones. Modem signals are routed to the "on board" 300 baud modem.

The addition of a UTI to your OSI computer will allow computer to computer, computer to human, and human to

computer communications. Several typical applications of these types of communication are presented below.

The UTI will allow computer to computer communication by operating as a conventional auto-answer, auto-dial, answer or originate 300 baud modem with "hands off" operation. This allows OSI computers to be remotely timeshared economically as well as being the basis of computer bulletin board services. Another application is the automatic interrogation of two UTI based computers for remote process control or remote data acquisition.

An OSI computer, when equipped with a UTI and OSI's security monitor, can provide computer to human communication by providing a complete security system including the monitoring if a home, business, warehouse, vacation home, boat, etc. This computer based security system can notify any telephone number (or numbers) with a Votrax or tape recorded message.

Applications of human to computer communication using a UTI based computer include allowing a caller's telephone to act as a "computer terminal", or allowing caller interrogation of security or system status using touch tone commands. When a UTI based computer is used in conjunction with the A.C. remote control and/or parallel I/O, it allows a caller to control home lights and appliances as well as control of automated processes. Of course, the program would allow this type of control to be used only by caller who has entered a correct password, thus giving only authorized persons control of these devices.

A UTI based computer equipped with a cassette tape recorder can act as a telephone answering device. In addition, if a remote rewind tape deck, endless tape or A/D-D/A system is added, the computer system can relay voice messages including caller initiated playback of recorded messages and caller stored messages for relay to another phone number at another time and/or to be attempted until the message gets through.

The UTI comes complete with documentation on how to use each feature as well as two copies of the OS-65D V3.2 "PHONE DEMO" diskettes.

Included are such programs as:

- A "Home Monitor" demo which allows a touch tone equipped caller to interrogate the status of an AC-17P home security system. The caller may also send commands to lamps and appliances via the AC-12P A.C. Remote Control system.
- An "Automatic Dial a Modem" program allows a UTI equipped computer to function as a timeshare terminal with "hands off" modem operation.
- "Remote Computer Interrogation" demo program which requires two UTI computers. One computer automatically interrogates the other one. This demonstrates the capability of remote monitoring and process control systems.

Licensed Level 3 users will be provided with a version of a Level 3 system which will allow one partition of their timeshare system to be available for telephone communications.

Summary

The Ohio Scientific Universal Telephone Interface is a cost effective way to complete the link between the computer and the telephone. It allows the computer to easily access outside information via large time share systems and data bases. In addition, it allows remote interrogation and operation of the computer from any telephone. These are just a few of the more common applications of the Universal Telephone Interface, with unlimited applications to meet specific requirements.

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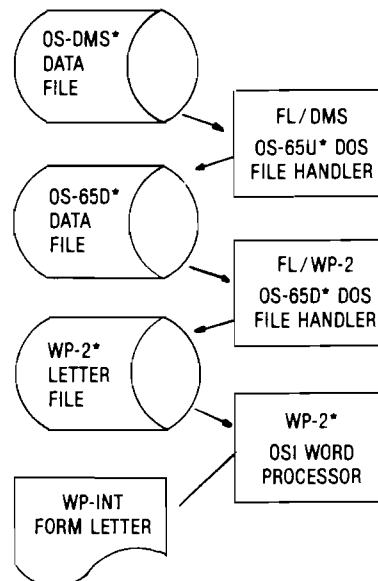
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BASIC and Machine Language with the Micromodem II

George J. Dombrowski, Jr.

There is no doubt that the Micromodem II produced by D.C. Hayes Associates for use with the Apple II computer is a very sophisticated telecommunications device. I purchased a Micromodem several months ago and have been pleased with its performance ever since. This device couples directly with Ma Bell and can be easily programmed to automatically answer your phone or even to transmit short messages to other machines.

One of the best features provided by D.C. Hayes Associates is the well documented 85 page manual, complete with example programs. However, despite the quality of this manual, there is a glaring omission. I originally purchased the Micromodem II with the notion of easily transferring machine language and BASIC programs to other Apple owners. Although the manual details a procedure for adapting Apple Computer's Datamover program to the Micromodem firmware, easier more direct methods of sending BASIC programs to another computer were not described. This article describes an immediate mode procedure for transferring BASIC programs and also provides an APPLESOFT routine for sending machine language programs or binary data to another Apple II.

Sending a BASIC program in immediate mode is a simple matter using the Micromodem II. Once the phone connection has been established, the receiving computer must be placed in remote mode by sending a CTRL R followed by PR #S where S = modem slot #. When the basic prompt appears, remote control of the Apple at the other end has been achieved. The receiving computer is now waiting input. It will accept commands and input from its own keyboard, your keyboard or those issued automatically by your computer during program execution. In other words, the receiving computer will accept a LISTing of a

```
10 REM BASIC TRANSFER/MICROMODEM II
20 REM FIRST RUN THIS PROGRAM AND THEN
30 REM ESTABLISH REMOTE CONTROL OF RECEIVING MACHINE
40 REM LEAVE TERMINAL MODE BY TYPING CTRL-A/CTRL-X
50 REM THEN TYPE <EXEC BASIC PROGRAM TRANSFER>
60 D$ = CHR$(4)
70 PRINT D$"OPEN BASIC PROGRAM TRANSFER
80 PRINT D$"WRITE BASIC PROGRAM TRANSFER"
90 PRINT "POKE 1530,80:REM FOR LONG FLOATING POINT PRGMS A
    GREATER DELAY MAY BE REQUIRED.
100 PRINT "POKE 1914,18"
110 PRINT "POKE 33,30"
120 PRINT "IN #0"
130 PRINT "PR #2"
140 PRINT "LIST"
150 PRINT "PR #0"
160 PRINT "IN #2"
170 PRINT "TEXT"
180 PRINT "POKE 1530,3"
190 PRINT "POKE 1914,138"
200 PRINT D$"CLOSE"
210 END
```

program sent from another computer and interpret each line as a command. Before LISTing the program, however, a few additional steps must be taken in order to set up both computers for the transfer.

Once remote control of the receiving machine has been established, the appropriate BASIC must be initialized by typing either the INT or FP DOS command. At this point output from the remote computer should be directed to the video port by executing a PR #0. This is a precautionary step to prevent the accidental transmission of messages generated by the receiving machine's command interpreter. These messages could be received by the sending computer and interfere with the program transfer. The operator of the sending computer will not see the basic prompt return after this command. In order to LIST the program on your computer, terminal mode must be exited by typing CTRL-A/CTRL-X. The receiving

Although this procedure seems complicated, after using it a few times it is easy to remember. For those of you who like to sit back and watch your machine do the work, the following program will create an EXEC file for this purpose.

From now on the commands typed at the local keyboard will not be sent to the remote machine. First, the firmware carriage-return-delay for out-going data must be set by typing POKE 1912 + S,18 followed by POKE 1528 + ,80. The pause after each carriage return allows sufficient time for the receiving machine to interpret and execute each line before another is sent. Register 1528 + S normally contains decimal 3 in terminal mode, which corresponds to a delay of 30 msec. Second, the program to be sent is loaded and the LIST formatting routine disabled by typing POKE 33,30. Finally, a PR #2 is issued and after the cursor returns (0.8 sec), the LIST command given.

Apple is left in remote mode waiting for input, while the sending computer is set up to LIST the program.

Run this program to create the EXEC file, and then LOAD the program you want to send. Finally, EXEC BASIC PROGRA, TRANSFER. This EXEC file will work with either BASIC. The user's machine will be placed in terminal mode when the transfer is finished. PR #2 must then be issued to the remote computer in order to receive its output.

Binary data or machine language programs can be transmitted in a similar fashion by employing a modified version of the monitor hexadecimal dump routine. Ordinarily upon hitting RETURN this routine displays a hexadecimal address followed by a hyphen following the address. The substitution is necessary because the monitor interpreter requires a colon to immediately follow the address when

binary data portion of the F8 ROM chip(\$FD92-\$FDC5) to RAM memory at \$1000-\$1033. Address \$100D was altered from \$A0 ("-") to \$BA ("."). In addition, the address for the JSR in-

struction at \$1021-\$1023 was changed from \$FD92 to \$1000. This HEX dump routine has been incorporated into an APPLESOFT BASIC program which takes care of the housekeep-

ing chores described above for transferring BASIC programs plus a few more. Both the APPLESOFT program and the relocated binary routine at \$1000 are listed below.

```

10 REM BINARY TRANSFER/MICROMODEM II
20 DS = CHR$(4)
30 PRINT DS;"HOMON C,I,C"
40 GOSUB 420
50 INPUT "IS RECEIVING COMPUTER IN REMOTE MODE WITH EITHER
   BASIC INITIALIZED ? ";ANS$
60 PRINT
70 IF LEFT$(ANS$,1) < > "Y" THEN PRINT "TRANSFER
   ABANDONED": END
80 POKE 1530,60: POKE 1914,18: REM 600 MSEC WAIT AFTER
   CARRIAGE RETURN. AUTO LINE FEED IS ACTIVATED AND THE
   WAIT FUNCTION + LOCAL DISPLAY ENABLED.
90 PRINT "STARTING ADDRESS -": INPUT "(MUST END WITH 0 OR
   8) ";ST$
100 REM LINES 110/170 - HEXADECIMAL TO DECIMAL CONVERSION.
110 Z$ = "0123456789ABCDEF"
120 FOR I = LEN(ST$) TO 1 STEP - 1
130 FOR J = 1 TO LEN(Z$)
140 IF MID$(Z$,J,1) < > MID$(ST$,I,1) THEN NEXT J
150 DEC = DEC + (J - 1) * (16 ^ X)
160 X = X + 1: NEXT I
170 HB = INT(DEC / 256): LB = DEC - (HB * 256)
180 REM LINE 190 PLACES THE DECIMAL EQUIVALENTS OF THE
   HIGH & LOW BYTE ADDRESS INTO THE PAGE 0 LOCATIONS USED
   BY THE MEMORY DUMP ROUTINE.
190 POKE 61,HB: POKE 60,LB
200 INPUT "NUMBER OR BYTES (DECIMAL) ";NB
210 PRINT : INVERSE : HTAB 6: PRINT "HITTING ANY KEY
   ABORTS TRANSFER": NORMAL
220 PRINT DS;"IN #0"
230 PRINT DS;"PR #2"
240 PRINT "CALL -151"
250 PRINT : REM SENDS CARRIAGE RETURN.
260 FOR I = 1 TO INT(NB / 8) + 1
270 IF PEEK(-16384) > 127 THEN POKE -16368,0: GOTO
   300
280 CALL 4113: REM CALLS MACHINE LANGUAGE ROUTINE BELOW.
290 NEXT I
300 PRINT
310 PRINT "3DOG"
320 PRINT DS;"PR #0"
330 PRINT
340 POKE 1530,3: REM NORMAL 30 MSEC WAIT
350 PRINT " *** ALL DONE ***"
360 PRINT : PRINT "THE SENDING COMPUTER IS NOW IN TERMINAL
   MODE & THE RECEIVING COMPUTER HAS BEEN RETURNED WITH
   BASIC UP IN REMOTE MODE."
370 PRINT : INVERSE : HTAB 15: PRINT "HIT RETURN": NORMAL
380 PRINT DS;"IN #2"
390 POKE 1914,138: REM INITIATE TERMINAL MODE/FULL-DUPLEX
   (USE 10 FOR HALF-DUPLEX).
400 END
410 REM LINES 420/450 LOAD RELOCATED MEMORY DUMP ROUTINE
   AT $1000.
420 FOR M = 4096 TO 4147: READ D: POKE M,D: NEXT M
430 RETURN
440 DATA 164,61,165,60,32,142,253,32,64,249,160,0,169,186,
   76,237,253,165,60,9,7,133,62,165,61,133,63,165,60,41,7,
   208,3,32,0,16
450 DATA 169,160,32,237,253,177,60,32,218,253,32,186,252,
   144,232,96
460 REM THE BASIC PRGM + DUMP ROUTINE OCCUPY $800-$1040.
   IF THE BINARY DATA TO BE SENT RESIDES IN THIS RANGE,
   IT MUST FIRST BE RELOCATED WITH THE MONITOR MOVE
   COMMAND.

```

NOTE: These Programs were designed for micromodem to reside in slot 2. If another slot is chosen, registers 1530 + 1914 in the page listings must be changed to 1528 + S, respectively where S = Modem slot #

Although these methods require little software and are easy to implement, they do have a disadvantage. The time required to send BASIC and machine language programs using these techniques is greater (approx. 20 % and 130 %, respectively) than would be expected from the time calculated based upon program length. This is because both INTEGER BASIC and APPLESOFT programs are stored in memory with reserved words tokenized. Tokenized words such as PRINT, POKE, or NEXT require only one byte of memory. Sending a byte at 300 baud takes about 1/30 second, however, with the LISTing procedure described here, transmitting a reserved word such as PRINT requires approximately 5/30's of a second. Similarly, with machine language programs, for every 8 bytes of data transferred, a 4 digit hexadecimal address, colon, and 8 pairs of hexadecimal data must be sent. A total of 21 characters are sent for every 8 bytes of memory.

In spite of this disadvantage, these techniques are handy for sending medium sized programs over short distances where time is not a costly factor. μ

Relocated Monitor Hex Dump

1000	A4	3D	LDY	\$3D
1002	A6	3C	FD LDX	\$3C
1004	20	8E	F ^o JSR	\$FD8E
1007	20	40	JSR	\$F940
100A	A0	00	LDY	#\$00
100C	A9	BA	FD LDA	#\$BA
100E	4C	ED	JMP	\$FDED
1011	A5	3C	LDA	\$3C
1013	09	07	ORA	#\$07
1015	85	3E	STA	\$3E
1017	A5	3D	LDA	\$3D
1019	85	3F	STA	\$3F
101B	A5	3C	LDA	\$3C
101D	29	07	AND	#\$07
101F	D0	03	10 BNE	\$1024
1021	20	00	JSR	\$1000
1024	A9	A0	FD LDA	#\$A0
1026	20	ED	JSR	\$FDED
1029	B1	3C	FD LDA	(\$3C),Y
102B	20	DA	FC JSR	\$FDDA
102E	20	BA	JSR	\$FCBA
1031	90	E8	BCC	\$101B
1033	60		RTS	

PET-16

For those PET owners who have envied the Sweet-16 software of the Apple, here is PET-16.

Rev. James Strasma

Fellow PET users, have you envied APPLE people their 16-bit "dream machine"? Now you can have your own PET-16. Converting Apple's Sweet 16 to run on a PET is a fairly simple matter. Three changes are required.

First the program is relocated into user memory.

Second, it is altered to exchange a portion of zero page with an unused part of memory. This is necessary because PET Basic and Sweet-16 both use the first 32 memory locations in zero page extensively.

Third, Sweet-16 calls two Apple ROM routines that PET doesn't have. They are

'Save' & 'Restore'. They remember the contents of all the 6502 registers during a program and restore to the original conditions at the end of the program. Thus, this ability must be added to the program. With These few changes, Sweet-16 is quite usable with a PET.

If you have a macro assembler, one key use of PET-16 is in macros. This makes it easier to include simple double-byte routines in programs. Richard C. Vile's article in Micro #20 provides many desirable macros for programming in Sweet-16. Only one line needs to be changed...the actual jsr to Sweet 16 in

line 123 of Vile's program. Simply change the destination to the start of the PET version. This is at \$2e62 in the enclosed listing. With that change, the macros are quite usable with PET.

Remember that PET-16 will need to be in memory at the same time as programs that call it. It is just as suitable for placing in a ROM on a PET as on an Apple. That would be the ideal way to keep it handy. Now, who will develop some good uses for PET-16

μ

2E60-16:2E6A

```

;      *** pet 16 ***
;      pet sweet 16 interpreter
;      let pet think it's got 16-bits
;      adaptation by James strasma
;
;      adapted from work of s. wozniak
;      as published in 11/77 byte mag.
;      see full description there
;      only changes commented here
;      to use with Richard C. Vile's
;      article in micro #20, page 25
;      change line 0123 there to:
;      0123      jsr sw16
;      with sw16=start of interpreter
;      relocators, see note @ 1370
;
;      .ba $2e62
;
;      org      .de $2e00
;      locs     .de $24
;      rol      .de 0
;      roh      .de 1
;      r14h     .de $1d
;      r15l     .de $1e
;      r15h     .de $1f
;      s16xas   .de $2f
;
;      interpreter proper
;
2E62- 20 0 2E  sw16      jsr sw16      ;save zero page
2E65- 85 20      save      sta $20      ;in apple's rom
2E67- 86 21      stx $21      ;save machine context
2E69- 84 22      stx $22
2E6B- 08          php
2E6C- 68          pla
2E6D- 85 23      sta $23
2E6F- BA          tsx
2E70- 86 24      stx $24
2E72- D8          old
2E73- 68          pla
2E74- 85 1E      sta $15l
2E76- 68          pla
2E77- 85 1F      sta $15h
2E79- 20 7F 2E  sw16b   jsr sw16b
2E7C- 40 79 2E      jmp sw16b
2E7F- E6 1E      sw16c   inc $15l
2E81- D0 02      bne sw16d
2E83- E6 1F      inc $15h
2E85- A9 2F      sw16d   lda $16xas
2E87- 48          pha
2E88- A0 00      ldy #0
2E8A- B1 1E      lda ($15l),y
2E8C- 29 0F      and #$f
2E8E- 0A          asl a
2E8F- AA          tax
2E90- 4A          lsr a
2E91- 51 1E      eor ($15l),y
2E93- F0 0B      beq tobr
2E95- 86 1D      stx $14h
2E97- 4A          lsr a
2E98- 4A          lsr a
2E99- 4A          lsr a
2E9A- A8          tay
2E9B- B9 E4 2E      lda ($15l-2),y
2E9E- 48          pha
2E9F- 60          rts
2EA0- E6 1E      tobr   inc $15l
2EA2- D0 02      bne tobr2

```

2EA4- E6 1F		inc #r15h	2F17- 95 01		sta #noh,x
2EA6- B0 E7 2E	tohr2	lda brtbl,x	2F19- 60		nts
2EA9- 48		pha	2F1A- A5 00	stat	lda #nol
2EAA- A5 1D		lda #r14h	2F1C- 81 00	stat2	sta (nol,x)
2EAC- 4A		lsh a	2F1E- A0 00		ldy #0
2EAD- 60		nts	2F20- 84 1D	stat3	sty #r14h
2EAE- 68	rtnz	pla	2F22- F6 00		inc #nol,x
2EAF- 68		pla	2F24- D0 02	inr	bne inr2
2EB0- A5 23	restore	lda ##23 ;in apple's rom	2F26- F6 01		inc #noh,x
2EB2- 48		pha ;restore registers	2F28- 60	inr2	nts
2EB3- A5 20		lda ##20	2F29- A1 00	ldat	lda (nol,x)
2EB5- A6 21		ldx ##21	2F2B- 85 00		sta #nol
2EB7- A4 22		ldy ##22	2F2D- A0 00		ldy #0
2EB9- 28		plo	2F2F- 84 01		sty #noh
2EBA- 20 C0 2E		jsr sps ;restore zero page	2F31- F0 ED		bex stat3
2EBD- 6C 1E 00		jmp (r15l) ;exchange part of z. p.	2F33- A0 00	pop	ldy #0
2EC0- A2 24	sps	ldx #locs ;with given area of mem.	2F35- F0 06		bex pop2
2EC2- B0 00 2E	slop	lda op9,x	2F37- 20 69 2F	popd	jsr dcr
2EC5- 48		pha	2F3A- A1 00		lda (nol,x)
2EC6- B5 00		lda #0,x	2F3C- A8		tau
2EC8- 3D 00 2E		sta op9,x	2F3D- 20 69 2F	pop2	jsr dcr
2ECB- 68		pla	2F40- A1 00		lda (nol,x)
2ECC- 95 00		sta #0,x	2F42- 85 00		sta #nol
2ECE- CA		dex	2F44- 84 01		sty #noh
2ECF- 10 F1		brl slop ;max.=\$7f locations	2F46- A0 00	pop3	ldy #0
2ED1- 60		nts	2F48- 84 1D		sty #r14h
2ED2- B1 1E	setz	lda (r15l),y	2F4A- 60		nts
2ED4- 95 01		sta #noh,x	2F4B- 20 29 2F	lddat	jsr ldat
2ED6- 88		dey	2F4E- A1 00		lda (nol,x)
2ED7- B1 1E		lda (r15l),y	2F50- 85 01		sta #noh
2ED9- 95 00		sa #nol,x	2F52- 4C 22 2F		jmp inr
2EDB- 98		tea	2F55- 20 1A 2F	stdat	jsr stat
2EDC- 38		sec	2F58- A5 01		lda #noh
2EDD- 65 1E		add #r15l	2F5A- 81 00		sta (nol,x)
2EDF- 85 1E		sta #r15l	2F5C- 4C 22 2F		jmp inr
2EE1- 90 02		bcc set2	2F5F- 20 69 2F	steat	jsr dcr
2EE3- E6 1F		inc #r15h	2F62- A5 00		lda #nol
2EE5- 60	set2	nts	2F64- 81 00		sta (nol,x)
2EE6- 05	optbl	.by set-1	2F66- 4C 46 2F		jmp pop3
2EE7- FC	brtbl	.by rtn-1	2F69- B5 00	dcr	lda #nol,x
2EE8- 07		.by ld-1	2F6B- D0 02		bne dcr2
2EE9- A0		.by br-1	2F6D- D6 01		dec #noh,x
2EEA- 10		.by st-1	2F6F- D6 00	dcr2	dec #nol,x
2EEB- A1		.by bnc-1	2F71- 60		nts
2EEC- 28		.by ldat-1	2F72- A0 00	sub	ldy #0
2EED- B2		.by bc-1	2F74- 38	opn	sec
2EEE- 19		.by stat-1	2F75- A5 00		lda #nol
2EEF- B5		.by bp-1	2F77- F5 00		sbc #nol,x
2EF0- 4A		.by lddat-1	2F79- 99 00 00		sta nol,y
2EF1- BC		.by bm-1	2F7C- A5 01		lda #noh
2EF2- 54		.by stdat-1	2F7E- F5 01		sbc #noh,x
2EF3- C3		.by bz-1	2F80- 99 01 00	sub2	sta noh,y
2EF4- 32		.by pop-1	2F83- 98		tea
2EF5- CC		.by brz-1	2F84- 69 00		add #0
2EF6- 5E		.by steat-1	2F86- 85 1D		sta #r14h
2EF7- D5		.by bml-1	2F88- 60		nts
2EF8- 88		.by add-1	2F89- A5 00	add	lda #nol
2EF9- E0		.by bnm1-1	2F8B- 75 00		add #nol,x
2EFA- 71		.by sub-1	2F8D- 85 00		sta #nol
2EFB- 08		.by bk-1	2F8F- A5 01		lda #noh
2EFC- 36		.by popd-1	2F91- 75 01		add #noh,x
2EFD- EB		.by rs-1	2F93- A0 00		ldy #0
2EFE- 73		.by opn-1	2F95- F0 E9		bex sub2
2EFF- 96		.by bs-1	2F97- A5 1E	bs	lda #r15l
2F00- 21		.by inr-1	2F99- 20 1C 2F		jsr stat2
2F01- EA		.by nul-1	2F9C- A5 1F		lda #r15h
2F02- 68		.by dcr-1	2F9E- 20 1C 2F		jsr stat2
2F03- EA		.by nul-1	2FA1- 18	br	clo
2F04- EA		.by nul-1	2FA2- B0 0E	bnc	bos bnc2
2F05- EA		.by nul-1	2FA4- B1 1E	br1	lda (r15l),y
2F06- 10 CA	set	brl setz ;from here on must	2FA6- 10 01		brl br2
2F08- B5 00	ld	lda #nol,x ;be in same mem. as.	2FA8- 88		dey
	bk	.de =-1	2FA9- 65 1E	br2	add #r15l
2F0A- 95 00		sta #nol	2FAB- 85 1E		sta #r15l
2F0C- B5 01		lda #noh,x	2FAD- 98		tea
2F0E- 85 01		sta #noh	2FAE- 65 1F		add #r15h
2F10- 60		nts	2FB0- 85 1F		sta #r15h
2F11- A5 00	st	lda #nol	2FB2- 60	bnc2	nts
2F13- 95 00		sta #nol,x	2FB3- B0 EC	bc	bos br
2F15- A5 01		lda #noh	2FB5- 60		nts


```

2FB6- 0A      bp      asl a
2FB7- AA      tax
2FB8- B5 01      lda #roh,x
2FBA- 10 E8      bcl br1
2FBC- 60      nts
2FBD- 0A      km      asl a
2FBE- AA      tax
2FBF- B5 01      lda #roh,x
2FC1- 30 E1      kmi br1
2FC3- 60      nts
2FC4- 0A      bz      asl a
2FC5- AA      tax
2FC6- B5 00      lda #rol,x
2FC8- 15 01      ora #roh,x
2FCA- F0 D8      bea br1
2FCC- 60      nts
2FCD- 0A      bnz     asl a
2FCE- AA      tax
2FCF- B5 00      lda #rol,x
2FD1- 15 01      ora #roh,x
2FD3- D0 CF      bne br1
2FD5- 60      nts
2FD6- 0A      bml     asl a
2FD7- AA      tax
2FD8- B5 00      lda #rol,x
2FDA- 35 01      and #roh,x
2FDC- 49 FF      eor #fff
2FDE- F0 C4      bea br1
2FE0- 60      nts
2FE1- 0A      nrm1    asl a
2FE2- AA      tax
2FE3- B5 00      lda #rol,x
2FE5- 35 01      and #roh,x
2FE7- 49 FF      eor #fff
2FE9- D0 B9      bne br1
2FEB- 60      nts
2FEC- A2 18      ns     ldx #18

2FEE- 20 69 2F      jsr dcr
2FF1- A1 00      lda (rol,x)
2FF3- 85 1F      sta #r15h
2FF5- 20 69 2F      jsr dcr
2FF8- A1 00      lda (rol,x)
2FFA- 85 1E      sta #r15l
2FFC- 60      nts
2FFD- 4C AE 2E      rtn     jme rtnz
                        .en

--- LABEL FILE: ---

add =2F89
bm =2FBD
bnc2 =2FB2
br =2FB6
br2 =2FA9
bz =2FC4
dcr =2F69
inr2 =2F28
lddat =2F4B
outb1 =2EE5
pop3 =2F46
r15h =001F
roh =0001
rtn =2FFD
save =2E65
setz =2ED2
st =2F11
stat3 =2F20
sub =2F72
sw16b =2E79
tobr =2EA0
//0000,3000,3000
]

bc =2FB3
bml =2FD6
bnc1 =2FE1
br =2FA1
brtbl =2EE7
cpx =2E00
dcr2 =2F6F
ld =2F08
loos =0024
pop =2F33
popd =2F37
r15l =001E
rol =0000
rtnz =2EAE
set =2F06
slor =2EC2
stat =2F1A
stdat =2F55
sub2 =2F80
sw16c =2E7F
tobr2 =2EAE

bk =2F09
bnc =2FA2
bnz =2FCD
br1 =2FA4
bs =2F97
cpr =2F74
inr =2F22
ldat =2F29
nul =2FEB
pop2 =2F3D
r14h =001D
restore =2EB0
rs =2FEC
sl6cas =002F
set2 =2EE5
swa =2EC0
stat2 =2F1C
stkat =2F5F
sw16 =2E62
sw16d =2E85

```

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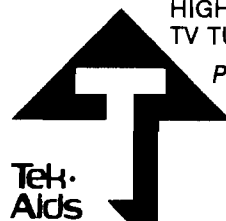
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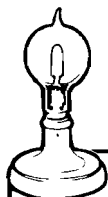


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```
LIST
10 GOSUB 99
15 PRINT I
16 GOTO 10
99 INPUT J
100 IF J = 0 THEN END
200 I = SQR(J):RETURN
READY

RENUMBER 100,10

READY.
LIST

100 GOSUB 130
110 PRINT I
120 GOTO 100
130 INPUT J
140 IF J = 0 THEN END
150 I = SQR(J):RETURN
READY
```

```
RUN
?DIVISION BY ZERO ERROR IN 500
READY
HELP
500 J = SQR(A*B/%)
READY
```

```
RUN
READY
DUMP
A1 = 10
BW = -6.1
CS = "HI"
READY
```

```
APPEND INPUT
PRESS PLAY ON TAPE #1
OK

SEARCHING FOR INPUT
FOUND INPUT
APPENDING
READY
```

```
TRACE
READY
RUN
ENTER YOUR NAME? JIM
HI JIM
HOW OLD ARE YOU?
#100
#110
#150
#160
#175
#200
```

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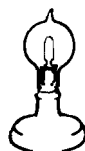
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Slide Show for the SYM

The Apple to SYM Picture Translator permits a SYM with a Visible Memory to use the Apple cassette tapes to put on a 'Slide Show' of its own.

David P. Kemp

Anyone who has visited a computer store recently should be familiar with the program 'Slide Show'. It is a collection of high resolution pictures for the Apple II which occupies two volumes of Apple's user contributed software bank. Photographic images like those of 'Slide Show' are real attention getters and are an excellent demonstration of the capabilities of high resolution graphics. The program described in this article allows the use of Apple Slide Show data to demonstrate the SYM-1/Visible Memory combination.

The visible memory (or K-1008 as it is officially known) is an 8K bit-mapped graphics board for KIM bus computers. It is an almost indispensable addition to the basic SYM-1 as it can be used to perform four distinct functions. As a high resolution graphics device it displays 200 lines by 320 columns for a resolution greater than either the Apple or the PET. As an ordinary 8K block of memory it augments the SYM's limited amount of onboard RAM (4K). As a text display it is faster than a serial terminal, although its maximum density of 25 by 53 characters is inferior to the 25 by 80 format of most terminals. Its most unusual use is that implied by its name. I have found it extremely helpful in debugging a program to be able to see what is going on in memory while the program is executing. This can be done using the visible memory without having to write a single line of special purpose debugging code. By simply placing an I/O buffer in the visible memory address space, for example, it is possible to see graphically exactly when and how the buffer's contents are changing. The Apple's

hires buffer is unsuitable for this purpose because its contents appear on the screen in scrambled order, and the PET and Radio Shack displays cannot be used because they are character oriented. Thus it appears that the visible memory is unique in allowing this very useful mode of operation.

This article is concerned with the visible memory as a pseudo-grey-scale display rather than as a debugging tool. Its manufacturer, Micro Technology Unlimited, sells basic text and graphics subroutines for the board, but there has been little of any published software which makes effective use of it. This program was written to fill a small part of that vacuum. It reads a cassette tape of an Apple hires image and displays it using a portion of the visible memory.

There are actually two tasks performed by the program: reading data from cassette, and translating the data from Apple high resolution format to a form suitable for use by the visible memory. Because the processor must monitor every bit coming off the tape and because the data translation sometimes requires more than one bit time to complete, the program is a prime candidate for interrupt driven I/O. It could be written without using interrupts by performing the two tasks serially (reading first, then translating) but this approach requires two 8K blocks of memory, which is more than is available on many systems. Interrupts allow both tasks to run simultaneously by making use of processor time that would otherwise be wasted. The cassette reading task is assigned to the interrupt service routine because it must

operate in real time if it is to operate at all. The data translation task runs whenever the interrupt routine is not running, ie. it operates in the 'background'.

The most straight forward way of setting up an interrupt structure would be to generate an interrupt request each time the cassette input line changes state. Unfortunately on the SYM this line is connected to a parallel input port where it is not able to trigger an interrupt. The solution to this problem is to use a timed interrupt to enter the service routine and then remain in a wait loop until a tape transition occurs. This technique has the disadvantage of wasting a significant amount of time in the interrupt routine, but it does not matter in this program because the background routine does not require a great deal of time.

The interrupt service routine is responsible for reading bits from cassette, packing them into bytes, and passing the packed data to the background program. It uses two of the SYM's seven programmable timers. One is used to generate interrupts; the other keeps track of the time between tape transitions. If this time is greater than a threshold, the cycle represents a one bit, otherwise it is a zero. The interrupt routine packs the received bits until eight have been accumulated, at which time it stores the packed byte in location BYTE where it can be used by the background program. Because the service routine can be entered at any point in the main program, it must leave all processor registers as it found them. This routine performs bit counting and packing operations directly in

memory where they will not interfere with the operation of the main program, thus the accumulator is the only register that must be saved and restored.

Once it has been determined that the cassette input routine will be interrupt driven, the remainder of the program is coded without regard to that fact. In particular, subroutine GETBYT which retrieves data from cassette, contains no explicit timing instructions and just assumes that data will magically appear in memory location BYTE when it becomes available. The background program handles the task of translating image data from Apple format to visible memory format. This includes four distinct operations - reversing bits, packing seven bit bytes into eight bit bytes, unscrambling line numbers, and discarding unused data bytes. The first two operations are handled by subroutine READLN, which reads forty consecutive bytes from tape into thirty five consecutive bytes in the visible memory. The other two operations are handled by subroutine LNADR, which calculates the correct memory address for storing the next line of data or indicates that data is to be ignored. For a complete description

of the Apple's convoluted hires memory organization, see MICRO 7:43. The visible memory organization of 320 points by 200 lines is more straightforward. The first forty bytes are displayed on line one, bytes 40-79 on line two, bytes 80-119 on line three, and so on. The bits in each byte appear in order with bit 7 (MSB) to the left and bit 0 (LSB) to the right on the screen. The author's visible memory has been modified to display the maximum 204 lines instead of 200 by altering one trace on the PC board. This modification has no effect on the appearance or organization of the original 200 lines, and since the Apple hires screen contains only 192 lines the modification is not needed to display a full image.

Using the program is a simple matter once some suitable input data is available. This can be obtained using the Slide Show program's write option, or the Apple monitor command 2000. 3FFFW will dump any arbitrary image in the primary hires buffer to tape. (4000.5FFFW will dump the secondary hires buffer.) Play the Apple tape into the SYM and run PICTR at location 200. The image will be loaded into the visible memory in scrambled order as it was placed on the tape, but once the load is complete, the im-

age appears as it did on the Apple screen. The visible memory should be cleared prior to running PICTR because old data will form an undesirable border along the right and bottom margins of the image.

Slide Show images are not the only pictures that can be used with the visible memory of course, but they are the most widely available. Its is possible to digitize almost anything using a graphics tablet, facsimile machine, or TV camera. The author has produced several images for the visible memory in addition to those available for the Apple, but for many users the only source of photographic data is the Apple library. I hope that this program will stimulate the interest of SYM users in both the visible memory and graphic image processing. μ

~~~~~  
David Kemp is the owner of an Apple, a SYM, and a Homebrew machine, loosely based on the OSI model 400. His other interests include music, speech, graphics, and interfacing non-standard peripheral hardware. He has developed and is selling an interface to the T.I. 'Speak and Spell', and he is working on other hardware for small systems.  
~~~~~

```

1
2
3
4
5
6
7
8
9
10
11 00E0      TMP=   $E0                ;scratchpad
12 00E1      SCNT=  TMP+1              ;seven bit counter
13 00E2      LINE=  SCNT+1             ;VM line address
14 00E2      PROD=  LINE               ;equivalent labels used by MULBYT
15 00E3      MPCD=  PROD+1
16 00E4      LINCNT=LINE +2            ;line counter
17 00E5      BYT=   LINCNT+1           ;interrupt routine bit buffer
18 00E6      BYTE=  BYT+1              ;cassette read data
19 00E7      BCNT=  BYT+1              ;interrupt routine bit counter
20 00E8      LEVEL= BCNT+1             ;cassette input polarity
21
22 8DA9      START= $8DA9              ;configure for cassette I/O
23
24 A000      P10RB= $A000              ;VIA #1 base address
25 A004      P1T1L= P10RB+4            ;interrupt timer registers
26 A005      P1T1H= P10RB+5
27 A00B      P1ACR= P10RB+$B           ;auxilliary control register
28 A00D      P1IFR= P10RB+$D           ;interrupt flag register
29 A00E      P1IER= P10RB+$E           ;interrupt enable register
30 A000      TAPIN= P10RB              ;cassette input on bit 6
31
32 A406      TIMER= $A406              ;transition timer read register
33 A415      TIM8=  $A415              ;transition timer write register
34 A678      UIRQVC=$A678              ;user IRQ vector location
35
36 0020      VMPAGE=$20                ;Visible Memory page address
37
38          *= $200
39
40          ; *****

```

```

41 0200 20 C0 02 PICTR JSR SYNC ;set up timer, get cassette header
42 0203 A2 00 LDX #0
43 0205 86 E6 STX BYTE ;initialize read data variable
44 0207 8E 0B A0 STX P1ACR ;set interrupt timer one shot mode
45 020A 8E 05 A0 STX P1T1H ;trigger interrupt timer
46 020D A9 C0 LDA #C0
47 020F 8D 0E A0 STA P1IER ;enable timer interrupts
48 0212 58 CLI ;enable IRQs
49 0213 86 E4 PICT1 STX LINCNT ;set line counter
50 0215 20 2C 02 JSR LNADR ;calculate line address
51 0218 D0 05 BNE PICT2
52 021A 20 77 02 JSR RD8 ;throw away 8 bytes every 3 lines
53 021D F0 03 BEQ PICT3
54 021F 20 53 02 PICT2 JSR RDLN ;read line (40 bytes) into display
55 0222 A6 E4 PICT3 LDX LINCNT
56 0224 E8 INX ;advance to next line
57 0225 D0 EC BNE PICT1 ;continue if screen not full
58 0227 8E 0E A0 STX P1IER ;else disable interrupts
59 022A 78 SEI ;disable IRQs
60 022B 60 RTS ;and return to monitor
61

```

```

62 ;*****
63 022C 8A LNADR TXA ;scramble line count to produce
64 022D 0A ASL A ;correct address for loading image
65 022E AA TAX
66 022F 29 38 AND #38 ;performs the following bit mapping
67 0231 85 E0 STA TMP ; 7 -> 2
68 0233 8A TXA ; 6 -> 1
69 0234 2A ROL A ; 5 -> 0
70 0235 2A ROL A ; 4 -> 5
71 0236 2A ROL A ; 3 -> 4
72 0237 AA TAX ; 2 -> 3
73 0238 29 07 AND #7 ; 1 -> 7
74 023A 05 E0 ORA TMP ; 0 -> 6
75 023C 85 E0 STA TMP
76 023E 8A TXA ; made necessary by the Apple's
77 023F 0A ASL A ; high resolution hardware
78 0240 0A ASL A
79 0241 29 C0 AND #C0
80 0243 C9 C0 CMP #C0
81 0245 F0 0B BEQ LNUL ;return z set if line # mod 4 = 0
82 0247 05 E0 ORA TMP
83 0249 A2 28 LDX #28 ;multiply scrambled line count by
84 024B 20 87 02 JSR MULBYT ;number of bytes per VM line
85 024E 09 20 ORA #VMPAGE ;***add VM base address***
86 0250 85 E3 STA LINE+1
87 0252 60 LNUL RTS
88
89 ;*****
90 0253 A0 00 RDLN LDY #0
91 0255 A2 08 LDX #8 ;initialize bit count for output byte
92 0257 A9 07 RDLN1 LDA #7
93 0259 85 E1 STA SCNT ;initialize bit count for input byte
94 025B 20 80 02 JSR RDBYT ;get a byte from cassette
95 025E 4A RDLN2 LSR A
96 025F 26 E0 ROL TMP ;reverse bit positions
97 0261 CA DEX
98 0262 D0 0D BNE RDLN3 ;check output count
99 0264 48 PHA ;done with output word
100 0265 A5 E0 LDA TMP
101 0267 91 E2 STA (LINE),Y ;store it in Visible Memory
102 0269 A2 08 LDX #8 ;reinitialize output shift count
103 026B 68 PLA
104 026C C8 INY
105 026D C0 23 CPY #35
106 026F B0 E1 BCS LNUL ;exit if line is done
107 0271 C6 E1 RDLN3 DEC SCNT
108 0273 D0 E9 BNE RDLN2 ;continue if input word not done
109 0275 F0 E0 BEQ RDLN1 ;else get another
110
111 ;*****
112 0277 A2 08 RDB LDY #8 ;initialize byte count
113 0279 20 80 02 RDB1 JSR RDBYT ;get a byte from cassette
114 027C CA DEX ;and throw it away
115 027D D0 FA BNE RDB1
116 027F 60 RTS
117
118 ;*****
119 0280 A5 E6 RDBYT LDA BYTE ;check ready flag
120 0282 10 FC BPL RDBYT ;wait if no data
121 0284 46 E6 LSR BYTE ;reset flag
122 0286 60 RTS
123

```

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```

124      ;*****
125 0287 4A      MULBYT LSR      A      ;single precision fast multiply
126 0288 85 E2      STA      PROD      ;enter: A,X = operands
127 028A 86 E3      STX      MPCD      ;return:
128 028C A9 00      LDA      #0      ;
129 028E A2 08      LDX      #8      ; PROD = product low byte byte
130 0290 90 03      MULB1 BCC      MULB2
131 0292 18      CLC
132 0293 65 E3      ADC      MPCD
133 0295 6A      MULB2 ROR      A
134 0296 66 E2      ROR      PROD
135 0298 CA      DEX
136 0299 D0 F5      BNE      MULB1
137 029B 60      RTS
138

139      ;***** timer interrupt service routine *****
140      ; assumes no other interrupts are active
141 029C 48      INT PHA      ;save accum
142 029D 20 E9 02 JSR      GETTR      ;get transition time
143 02A0 C9 A8      CMP      #$A8
144 02A2 26 E5      ROL      BYT      ;build byte
145 02A4 C6 E7      DEC      BCNT      ;check bit count
146 02A6 D0 10      BNE      INTR      ;not done with byte yet
147 02A8 A5 E6      LDA      BYTE
148 02AA 30 13      BMI      ERR      ;overflow if flag not reset
149 02AC A5 E5      LDA      BYT
150 02AE 49 FF      EOR      #$FF      ;correct polarity
151 02B0 09 80      ORA      #$80      ;set data available flag
152 02B2 85 E6      STA      BYTE      ;copy data to byte
153 02B4 A9 08      LDA      #$8
154 02B6 85 E7      STA      BCNT      ;reinitialize bit count
155 02B8 A9 00      INTR LDA      #0
156 02BA 8D 05 A0 STA      PIT1H      ;retrigger interrupt timer
157 02BD 68      PLA      ;restore accum
158 02BE 40      RTI
159 02BF 00      ERR BRK      ;quit if overrun error
160

161      ;*****
162 02C0 20 A9 8D SYNC JSR      START      ;set up cassette interface
163 02C3 A2 9C      LDX      #INT
164 02C5 8E 78 A6 STX      UIRQVC      ;set interrupt vector
165 02C8 A2 02      LDX      #INT/$100
166 02CA 8E 79 A6 STX      UIRQVC+1
167 02CD A2 08      LDX      #$8
168 02CF 86 E7      STX      BCNT      ;initialize input bit count
169 02D1 A2 FA      LDX      #$FA
170 02D3 8E 04 A0 STX      PIT1L      ;set timer latch for 250 us
171 02D6 20 E3 02 SYNC1 JSR      GETTRS      ;look for leader
172 02D9 B0 E5      BCS      SYNC      ;start over if not stable
173 02DB CA      DEX
174 02DC D0 F8      BNE      SYNC1      ;get enough valid half cycles
175 02DE 20 E3 02 SYNC2 JSR      GETTRS      ;get sync bit
176 02E1 90 FB      BCC      SYNC2
177

178      ;*****
179 02E3 A5 E8      GETTRS LDA      LEVEL      ;get one half cycle time
180 02E5 49 40      EOR      #$40
181 02E7 85 E8      STA      LEVEL
182
183 02E9 AD 00 A0 GETTR LDA      TAPIN      ;get cassette input level
184 02EC 45 E8      EOR      LEVEL
185 02EE 29 40      AND      #$40
186 02F0 F0 F7      BEQ      GETTR      ;wait for end of first half cycle
187 02F2 AD 00 A0 GETTR1 LDA      TAPIN
188 02F5 45 E8      EOR      LEVEL
189 02F7 29 40      AND      #$40
190 02F9 D0 F7      BNE      GETTR1      ;wait for end of second half cycle
191 02FB AD 06 A4 LDA      TIMER      ;get time
192 02FE 48      PHA
193 02FF A9 FF      LDA      #$FF
194 0301 8D 15 A4 STA      TIM8      ;restart timer
195 0304 68      PLA
196 0305 C9 CE      CMP      #$CE      ;get data bit in C
197 0307 60      RTS
198
199      .END

```

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Hypocycloids on the OSI 540

Here is an update to the Hypocycloids Program which allows it to run on the OSI 540 video board.

E.D. Morris

In the October 1979 issue of MICRO (17:52) I made an offer to supply my Hypocycloids program to owners of OSI 440 video boards. Since then I have received many questions on how to convert this program for use with the newer 540 boards. The following program will draw hypocycloids on a 540 video board; however, the resolution is only 64 x 64. I will supply the program on tape for \$3.00 or free if you send me a tape with some of your programs.

Program Notes

Lines 840 to 940 ask for input parameters. For testing, try BIG GEAR = 28 and SMALL GEAR = 7 for a diamond or BIG GEAR = 25 SMALL GEAR = 10 for a five

pointed star. Lines 700-760 test if your parameters are reasonable, and, if not, it rejects them. Lines 770-830 calculate points on the hypocycloid curve. The subroutine at line 50 plots a line between OX, OY and NX, NY. This is Bresenham's line drawing algorithm. Note that the subroutine is written in very simple BASIC with no multiplication or division. Thus it can easily (?) be converted to machine code for increased speed. Lines 50-340 determine if the plot should be made using X or Y as an index and changes the sign of variables so that a line can be drawn in any direction. The subroutine from 550 to 630 is specifically for the OSI 540 video board. It turns on a spot at PX, PY. A resolution of 64 in the vertical direction is obtained by turning on half-

blocks. The subroutine must decide whether the upper or lower half must be turned on and also not erase a previous half-block. This subroutine can be replaced in other computers by SET PX, PY or PLOT PX, PY if you have either of these commands. μ

Earl Morris, Jr, a Ph.D. of Physical Chemistry is employed as a research chemist.

He purchased an assembled OSI CPU board about 2 years ago, and built up the remainder of his system from bare boards. He possesses a great interest in hardware and he has made extensive modifications to his own system.

```
10 E=53376
20 S(1,0)=155:S(1,1)=155:S(1,2)=161
30 S(2,0)=154:S(2,1)=161:S(2,2)=154
40 GOT0840
50 SX=NX:SY=NY:FL=0
60 DX=NX-0X
70 IFDX>0THEN90
80 DX=-DX
90 DY=NY-0Y
100 IFDY>0THEN120
110 DY=-DY
120 IF DX-DY<0 THEN480
130 REM X AXIS
140 DY=NY-0Y
150 IFDY<0THEN250
160 DX=NX-0X
170 IFDX<0 THEN220
180 DD=1
190 X=0X
200 Y=0Y
210 GOT0350
220 DX=-DX
230 DD=-1
240 GOT0190
250 DY=-DY
260 DX=NX-0X
270 IF DX<0 THEN320
280 DD=-1
290 X=NX
300 Y=NY
310 GOT0350
320 DX=-DX
330 DD=1
340 GOT0290
350 REM PLOT X AXIS +DY
360 R=DY+DY-DX
370 FORII=0TODX
380 IF FL=1 THENPX=Y:PY=X:GOT0400
390 PX=X:PY=Y
400 GOSUB550
```

```

410 IFR<=0THEN440
420 Y=Y+1
430 R=R-DX-DX
440 X=X+DD
450 R=R+DY+DY
460 NEXTII
470 GOTO530
480 REM Y AXIS
490 T=OX:OX=OY:OY=T
500 T=NX:NX=NY:NY=T
510 FL=1
520 GOTO130
530 OX=SX:OY=SY
540 RETURN
550 M=E+64*INT(PY/2)+PX
560 M=1+(PYAND1)
570 C=PEEK(M)
580 IFC=32 THENL=0:GOTO620
590 IFC=155 THEN L=1:GOTO620
600 IFC=154 THEN L=2:GOTO620
610 RETURN
620 POKEM,S(N,L)
630 RETURN

```

```

640 REM START PROGRAM
700 DT=30:OX=32+P:OY=30:F=6.2832/DT
710 I=1
720 DL=P*I/Q-INT(P*I/Q)
730 IF DL<.0001 THEN760
740 I=I+1:IFI>21 THEN840
750 GOTO720
760 PRINTI:W=P-Q
770 Z=(P-Q)/Q
780 FORJ=0TO I*DT
790 AN=J*F:T=Z*AN
800 NX=32+INT(W*COS(AN)+Q*COS(T))
810 NY=30+INT(W*SIN(AN)-Q*SIN(T))
820 GOSUB50:NEXTJ
830 GOTO830
840 FORJJ=1TO32:PRINT:NEXT
850 PRINT" COMPUTER SPIROGRAPH":PRINT:PRINT:PRINT
860 PRINT:INPUT"SIZE BIG GEAR (20-28)";P
870 IFP>28 THEN860
880 PRINT:INPUT"SIZE SMALL GEAR";Q
890 IFQ>P-4 THEN880
930 FORJJ=1TO32:PRINT:NEXT
940 GOTO700

```

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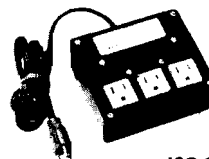
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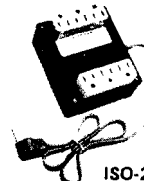
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TRACER: A Debugging Tool for the APPLE II

The Apple's Step/Trace routines are handy, but you will find them even more useful when used in conjunction with this Tracer program.

R. Kovacs

Introduction

The APPLE II's monitor in ROM is crammed with many useful routines. These include memory interrogation and modification, keyboard input, Crt display output and cassette I/O. In addition, Apple has thoughtfully provided a number of routines related to assembly language programming. A single-pass assembler and disassembler are invaluable aids in writing and reviewing machine code. A step/trace feature allows the user to control execution of his program during the software development phase.

The step routine executes a single instruction and displays its address, both Hex and disassembled code, the values of the A,X,Y,P registers and the stack pointer. The user has the opportunity to modify any register and continue execution of either the next instruction or any arbitrary one.

Unfortunately, all this information uses up the display rather quickly such that at best only the 11 most recent steps are shown. It seemed to me that it would be useful to display more PC history at the expense of other information.

The Program

The Tracer program was designed to operate in conjunction with APPLE's step/trace routines to enhance their usefulness. It is basically a formatter which controls the information output to the screen. This routine will display up to 160 of the most recent instructions executed. This is in addition to the usual

```
1000 * TRACER          R. KOVACS   28DEC79
1010 *
1020 *
1030 * ENTER VIA CONTROL-Y FOLLOWED BY XXXXT
1040 * WHERE XXXX IS THE ADDRESS TO BEGIN TRACING
1050 *
1060 *****
1070 *
1080 WNDBTM .EQ $23      BOTTOM OF SCROLLING WINDOW
1090 PCL   .EQ $3A      PGM COUNTER
1100 *
1110 WINDOW .EQ $FB3C   SET NORMAL SCROLL WINDOW
1120 BELL   .EQ $F8DD   TOGGLE SPEAKER
1130 CLEAR  .EQ $FC58   CLEAR SCREEN, HOME CURSOR
1140 COUT   .EQ $FDF0   OUTPUT CHAR TO SCREEN
1150 READ   .EQ $C000   KEYBOARD STROBE
1160 RESET  .EQ $C010   RESET KEYBOARD
1170 *
1180 BUFF   .EQ $0750   LINE#22-COL#0
1190 BUFF1  .EQ $07D0   #23    #0
1200 *
1210 *****
1220 *
1230 * SET UP CONTROL-Y JUMP TO $3F8
1240 *
1250      .OR $03F8
1260 *
03F8- 4C 00 03 1270      JMP TRINIT
1280 *
1290 *****
1300 *
1310 * TRACER INITIALIZATION
1320 *
1330      .OR $0300
1340      .TA $5300
1350 *
1360 *
0300- 20 3C FB 1370 TRINIT JSR WINDOW  CLEAR ENTIRE SCREEN
0303- 20 58 FC 1380      JSR CLEAR
0306- A9 15   1390      LDA #$15   SET SCROLL WINDOW
0308- 85 23   1400      STA WNDBTM
030A- A9 1C   1410      LDA #TRACER SET COUT HOOK
030C- 85 36   1420      STA $36    TO TRACER
030E- A9 03   1430      LDA /TRACER
0310- 85 37   1440      STA $37
0312- A9 1F   1450      LDA #$1F   INIT CH FOR EVEN PAGING
0314- 85 24   1460      STA $24
0316- A9 02   1470      LDA #$02   INIT PGCNT FOR
0318- 80 8C 03 1480      STA PGCNT   SINGLE STEP
031B- 60     1490      RTS
1500 *
1510 *****
1520 *
1530 *
031C- 8D B7 03 1540 TRACER STA SAVEA  SAVE A & Y
031F- 8C 88 03 1550      STY SAVEY  REGISTERS
0321- 2C BA 03 1560      BIT CRFLC  WAS LAST CHAR A CR?
0323- 30 1C   1570      BMI CR    YES
0327- C9 8D   1580      CMP #$8D  IS THIS CHAR A CR?
```

details (I.E. disassembled code and register displays) of the last instruction displayed. Features include single step and trace with paging. The user can either continue execution or temporarily exit to modify registers or memory. Tracer also looks for the break code (00) and waits for user action after announcing the break with a double bell. The last instruction executed before the break was encountered will still be displayed.

Caution: It should be recognized that Tracer's display lags by one instruction. If the monitor is entered via reset, the current register values saved may be different due to the next instruction having executed. Thus the user should check their values using the control-E monitor command.

A commented assembly listing is shown in Figure 1. The program is approximately 190 bytes long and is located starting at \$300. It uses no additional page zero memory.

How it Works

Tracer controls what information is displayed on the screen by manipulating the characters generated by the step/trace routines. Tracer looks for certain key characters and sequences to determine when one instruction has been completed.

A slight complication arises out of the 2-line display format used by APPLE. The character stream normally output to the screen after completion of a single step begins with a carriage return (\$8D). It is then followed by a line of printout whose first 4 characters are the Hex Address of the instruction just executed. This line is terminated with another carriage return and the second line is output.

Tracer looks for the carriage return which marks the beginning of the first line by diverting all characters to Tracer via the COUT hook. Subsequent characters are stored in a buffer. The second line is recognized by a carriage return followed by a space (\$A0). The next carriage return is used to output the 4 character Hex address from the buffer (plus a space) to the screen

0329-	F0	0C	1590		BEQ	SETCR	YES	
032B-	AC	B9	03	1600	STORE	LDY	BPTR	LOAD BUFF POINTER
032E-	99	50	07	1610		STA	BUFF,Y	NO, SO STORE IT
0331-	C8			1620		INY		INC POINTER
0332-	8C	B9	03	1630		STY	BPTR	& SAVE IT
0335-	00	05		1640		BNE	DONE	BRANCH ALWAYS
0337-	A0	80		1650	SETCR	LDY	#\$80	SET CR FLAG
0339-	8C	BA	03	1660		STY	CRFLG	
033C-	AD	B7	03	1670	DONE	LDA	SAVEA	RESTORE
033F-	AC	B8	03	1680		LDY	SAVEY	REGISTERS
0342-	60			1690		RTS		RETURN TO MONITOR STEP/TRACE
				1700	*			
0343-	A0	00		1710	CR	LDY	#\$00	RESET CR FLAG
0345-	8C	BA	03	1720		STY	CRFLG	
0348-	C9	A0		1730		CMP	#\$A0	IS NEXT CHAR A SPACE?
034A-	00	07		1740		BNE	ADDR-2	NO
034C-	A0	80		1750		LDY	#\$80	ADJ PTR TO NEXT
034E-	8C	B9	03	1760		STY	BPTR	LINE ON SCREEN
0351-	00	D8		1770		BNE	STORE	BRANCH ALWAYS
0353-	A0	00		1780		LDY	#\$00	INIT BUFF POINTER
0355-	B9	50	07	1790	ADDR	LDA	BUFF,Y	
0358-	20	F0	FD	1800		JSR	COUT	OUTPUT IT
035B-	C8			1810		INY		
035C-	C0	04		1820		CPY	#\$04	FINISHED PRINTING 4 CHAR ADDR?
035E-	90	F5		1830		BCC	ADDR	NO
0360-	A9	A0		1840		LDA	#\$A0	
0362-	20	F0	FD	1850		JSR	COUT	OUTPUT A SPACE
				1860	*			
				1870	* CHECK FOR BREAK			
				1880	*			
0365-	A0	00		1890		LDY	#\$00	
0367-	B1	3A		1900		LDA	(PCL),Y	GET OPCODE
0369-	F0	0C		1910		BEQ	KEY1	PAUSE IF BREAK
				1920	*			
				1930	* LOOK FOR KEYBOARD INPUT			
				1940	*			
036B-	CE	B8	03	1950	KEY	DEC	PGCNT	CHECK PAGING
036E-	F0	0D		1960		BEQ	KEY2	
0370-	2C	00	C0	1970		BIT	READ	ANY KEYBOARD INPUTS?
0373-	30	0D		1980		BMI	KEY3	YES
0375-	10	20		1990		BPL	TRACE	
0377-	20	D0	FB	2000	KEY1	JSR	BELL	SOUND BELL FOR BRK
037A-	20	D0	FB	2010		JSR	BELL	
037D-	A0	A0		2020	KEY2	LDY	#\$A0	RESET PAGE COUNTER
037F-	8C	B8	03	2030		STY	PGCNT	AND PAUSE
0382-	8D	10	C0	2040	KEY3	STA	RESET	
0385-	2C	00	C0	2050	KEY4	BIT	READ	LOOP UNTIL ANOTHER
0388-	10	F8		2060		BPL	KEY4	KEY IS HIT
				2070	*			
				2080	* TEST INPUT FOR TRACE,STEP OR QUIT			
				2090	*			
038A-	AD	00	C0	2100		LDA	READ	LOAD CHARACTER
038D-	C9	8D		2110		CMP	#\$8D	'RETURN' TO CONTINUE TRACE
038F-	F0	06		2120		BEQ	TRACE	
0391-	C9	A0		2130		CMP	#\$A0	'SPACE' TO SINGLE STEP
0393-	F0	05		2140		BEQ	STEP	
0395-	D0	E3		2150		BNE	KLY1+3	NO MATCH, TRY AGAIN
0397-	8D	10	C0	2160	TRACE	STA	RESIT	RE'ST KLYBOARD STROBE
039A-	EA			2170	STLP	NUF		
				2180	*			
				2190	* FILL PROTECTED FIELD WITH SPACES			
				2200	*			
039B-	A9	A0		2210		LDA	#\$A0	ASCII SPACE
039D-	A0	27		2220		LDY	#\$27	40 CHAR/LINE
039F-	99	50	07	2230	FILL	STA	BUFF,Y	
03A2-	99	00	07	2240		STA	BUFF1,Y	
03A5-	80			2250		DEY		
03A6-	10	F7		2260		BPL	FILL	
				2270	*			
03A8-	AD	B7	03	2280		LDA	SAVEA	
03AB-	A0	00		2290		LDY	#\$00	RESET BUFF POINTER
03AD-	8C	B9	03	2300		STY	BPTR	
03B0-	C9	80		2310		CMP	#\$80	IS 1ST CHAR 0-9/A-F ?
03B2-	90	83		2320		BCC	DONE	NO
03B4-	4C	2B	03	2330		JMP	STORE	YES,OUTPUT IT
				2340	*			
				2350	*			
03B7-	00			2360	SAVEA	.HS	00	
03B8-	00			2370	SAVEY	.HS	00	
03B9-	00			2380	BPTR	.HS	00	
03BA-	00			2390	CRFLG	.HS	00	
03BB-	00			2400	PGCNT	.HS	00	
				2410	.EN			

tional steps are executed by depressing the space bar. The addresses of previously executed instructions will begin to accumulate in the upper part of the display.

Since the buffer happens to be part of screen memory, then it too is displayed. The buffer region is protected by moving the bottom of the scrolling window.

The control Y function is used to initialize Tracer via a jump at \$3F8. It clears the screen, sets the scrolling window and sets the COUT hook at \$36 and \$37 to divert all characters normally displayed on the screen to Tracer.

Directions

Tracer is relatively simple to use:

1. Load Tracer starting at \$300.
2. Run the program via the monitor by typing: Y(C) XXXX T where Y(C) is a control Y and XXXX is the address where debugging is to begin. The screen will clear, tracer will become hooked via COUT and tracing begins as the specified address.
3. Tracer is initialized to single step and will halt after displaying the familiar step/trace information at the bottom of the screen. Addi-

4. One page (i.e. 160) of instructions can be executed by depressing the return key instead of the space bar. Control can be retained immediately by hitting any key.

5. Of course hitting reset returns the user back to the monitor where registers and memory can be manipulated if needed. Tracer can be reentered by typing: Y(C) T.

 μ

Oldest

160 Previously Executed Addresses

Most Recent

Figure 3: This illustrates Tracer's output format. Example is looping through Apple's WAIT routine at \$SCA8. The normal step/trace output for the current instruction is at the bottom of the screen and the previous 160 of program counter are listed above.

```

WNDBTM 0023    PCL    003A    WINDOW FB3C
BELL    FBDD    CLEAR  FC58    COUT   FDF0
READ    C000    RESET  C010    BUFF   0750
BUFF1   07D0    TRINIT 0300    TRACER 031C
STORE   032B    SETCR  0337    DONE   033C
CR       0343    ADDR   0355    KEY    036B
KEY1     0377    KEY2   037D    KEY3   0382
KEY4     0385    TRACE  0397    STEP   039A
FILL     039F    SAVEA  03B7    SAVEY  03B8
BPTR     03B9    CFLAG  03BA    PGCNT  03BB

```

Figure 4: Symbol Table

[illegible]

Normal Apple Stop/Trace Display

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 - With 133 item chart of accounts, 1000 postings into 70 regular accounts: less than 30 min.
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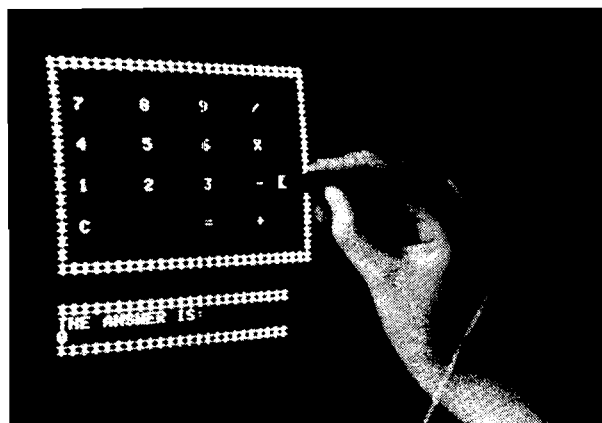
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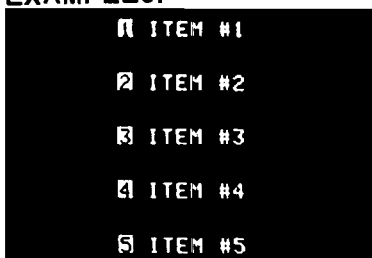
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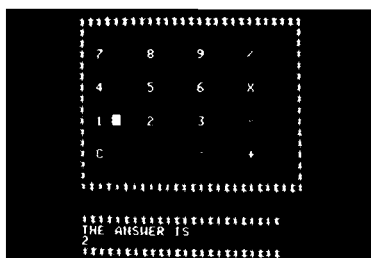
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- Pseudo Hi - Res Light Pen - 48K - Applesoft
- Light Pen Calculator - 32K - Integer
- Pen Organ 1.0 - 16K - Integer
- Music Pen - 16K - Integer
- Hi - Res Light Meter - 32K - Applesoft
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- Machine Language Pen Routines - 16K

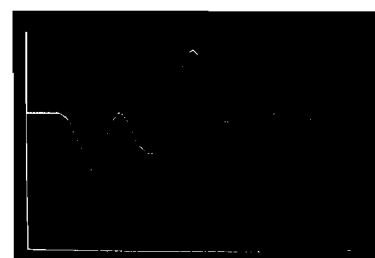
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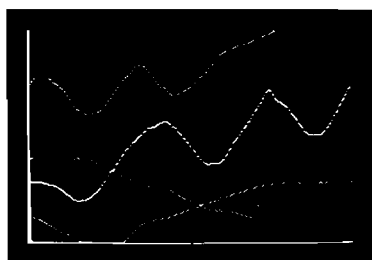
Menu Selector



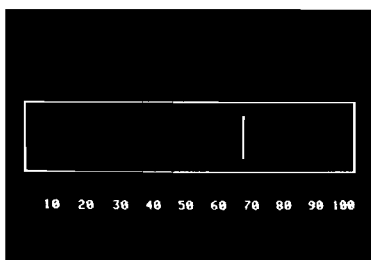
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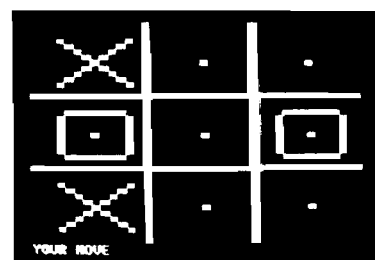
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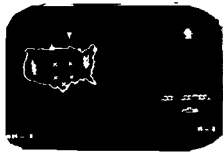
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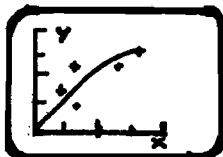
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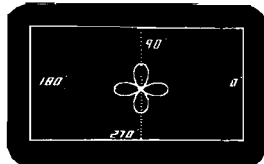


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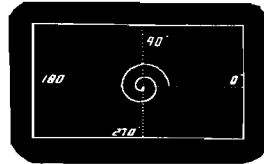


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Apple Menu Cookbook index-accessed data storage/retrieval program. Recipes stored, unlimited lines per entry. Easy editing. Formulated after N.Y. Times Cookbook. Other useful features included. Written by Wm. Merlino, M.D. \$19.95

Mailing List Program maintains complete record of name, address, phone no., mailing labels accommodated parallel card or built-in printer, easy data entry.

Diskette 32K \$19.95

Utility Pack combines five versatile programs by Vince Corsetti, for any memory configuration. **Applesoft Update*** Integer-to Applesoft conversion * Integer BASIC copy Binary Copy * Disk

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U.S. and foreign dealer and distributor inquiries invited
All programs require 16K memory unless specified

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Stop That PET - Update

Program updates to 'Stop That PET' for the new ROMs

The assembler file listing can be used to convert the program 'Stop That PET' by Gary Bullard in MICRO 22:57 for use with the new ROM PETs. The changed addresses are contained in lines 130 thru 200 or those labels defined as external.

The new PETs will go bye-bye on endless loops. The modifications have been tested on several loops and work as Mr. Bullard's article says they should.

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George R. Gaukel
335 ASA Co., Box 63
Ft. Lewis, WA 98433

```
0100;RESET
0110;
0120;
0130VECTOR      .DE $0090
0140KNT         .DE $009E
0150KBUF        .DE $026F
0160BASIC       .DE $C389
0170ASPR        .DE $CA1C
0180DCPR        .DE $DCD9
0190CONINT      .DE $E62E
0200STOP        .DE $F301
0210;
0220            .BA $1F40
0230            .OS
0240            .OE
0250;
0260START       SEI
0270            LDY VECTOR+1
0280            JSR SET
0290            CPY #$EE
0300            BNE NOTSET
0310            JSR RESET
0320NOTSET      CLI
0330            RTS
0340;
0350CKSTOP      JSR STOP
0360            BEQ STOPPD
0370            JMP CONINT
0380STOPPD      LDX #$00
0390SAVEM       PLA
0400            STA STK-1,X
0410            DEX
0420            BNE SAVEM
0430;
0440RESTK       LDA #H,BASIC
0450            PHA
0460            LDA #L,BASIC
0470            PHA
0480            LDA STATUS
```

```
0490            PHA
0500            PHA
0510            PHA
0520            PHA
0530            JSR SET
0540;
0550            LDX #H,09
0560            STX KNT
0570SETSYS      LDA SYS66-1,X
0580            STA KBUF-1,X
0590            DEX
0600            BNE SETSYS
0610            JMP CONINT
0620;
0630DISPLAY     LDY #H,HEADER
0640            LDA #L,HEADER
0650            JSR ASPR
0660            LDA LOC
0670            LDX LOC+1
0680            JSR DCPR
0690            LDY #0
0700            STY CNTR
0710ALLREG      LDY CNTR
0720            CPY #4
0730            BEQ START
0740            LDX STATUS,Y
0750            LDA #0
0760            JSR DCPR
0770            INC CNTR
0780            JMP ALLREG
0790;
0800            NOP
0810            NOP
0820;
0830SET         LDA #H,CONINT
0840            LDX #L,CONINT
0850SAVIT        STA VECTOR+1
0860            STX VECTOR
0870            RTS
0880RESET       LDA #H,CKSTOP
0890            LDX #L,CKSTOP
0900            JMP SAVIT
0910;
0920;
0930SYS66       .BY $91
0940            .BY $53
0950            .BY $59
0960            .BY $53
0970            .BY $38
0980            .BY $70
0990            .BY $36
1000            .BY $36
1010            .BY $80
1020            NOP
1030;
1040;
```

```
1050HEADER      .BY $91
1060            .BY $20
1070            .BY $41
1080            .BY $44
1090            .BY $44
1100            .BY $52
1110            .BY $20
1120            .BY $53
1130            .BY $54
1140            .BY $20
1150            .BY $41
1160            .BY $43
1170            .BY $20
1180            .BY $58
1190            .BY $52
1200            .BY $20
1210            .BY $59
1220            .BY $52
1230            .BY $00
1240            .BY $00
1250;
1260            .BA $1FE5
1270;
1280STK          .BY $00
1290            .BY $00
1300LOC         .BY $00
1310            .BY $00
1320STATUS      .BY $00
1330            .BY $00
1340            .BY $00
1350            .BY $00
1360CNTR        .BY $00
1370            .EN
//
```

```
LABEL FILE: [ / = EXTERNAL ]
/VECTOR=0090      /KNT=009E
/KBUF=026F
/BASIC=C389      /ASPR=CA1C
/DCPR=DCD9
/CONINT=E62E     /STOP=F301
START=1F40
NOTSET=1F4E      CKSTOP=1F50
STOPPD=1F58
SAVEM=1F5A      RESTK=1F61
SETSYS=1F76
DISPLAY=1F82    ALLREG=1F97
SET=1FAE
SAVIT=1FB2      RESET=1FB9
SYS66=1FC0
HEADER=1FCA     STK=1FE5
LOC=1FE7
STATUS=1FE9     CNTR=1FED
//08FF,0200,0200
```

6502 Resource Update

An list of magazines which contain information about the 6502 on a reasonably regular basis.

Did you ever wonder just what magazines were rich sources of information on the 6502 microprocessor, 6502-based microcomputers, accessory hardware and software? For several years this writer has been assembling a bibliography of 6502 references related to hobby computers and small business systems. The accompanying list of magazines has been compiled from this bibliography. An attempt has been made to give up-to-date addresses and subscription rates for the magazines cited. Subscription rates are for the U.S. Rates to other countries normally are higher.

GENERAL 6502

MICRO

\$15.00 per year, 12 issues

MICRO

P.O. Box 6502

Chelmsford, MA 01824

(Includes OSI Small Systems Journal)

COMPUTE

(PET, Atari, Apple)

\$9.00 per year, 6 issues

COMPUTE II

(AIM, SYM, KIM, OSI, ...)

\$9.00 per year, 6 issues

Compute

Small System Services, Inc.

900-902 Spring Garden Street

Greensboro, NC 27403

(Absorbed PET Gazette, 6502 Users Notes, and others)

GENERAL COMPUTER

BYTE

\$18.00 per year, 12 issues

Byte Publications, Inc.

70 Main Street

Peterborough, NH 03458

COMPUTER CASSETTES REVIEW

\$12.00 per year, quarterly

Robert Purser

P.O. Box 466

El Dorado, CA 95623

COMPUTER SHOPPER

\$10.00 per year

Glenn Patch, Editor

P.O. Box F

Titusville, FL 32780

(Has absorbed ON_LINE)

CREATIVE COMPUTING

\$14.00 per year, 12 issues

Creative Computing

P.O. Box 789-M

Morristown, NJ 07960

DIGITAL DESIGN

\$20.00 per year

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Mitch Kapon
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Hank Kolk
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200 Park Avenue, South
New York, New York 10003

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\$18.00 per year, 12 issues
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Peterborough, NH 03458

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[Editors' Note: A number of the smaller independent magazines have disappeared during the past year. Some have been incorporated in other journals - some have not.]

[Editor's Note: If your publication is not listed, and you think that it should be, then please put Dr. Dial on your subscription list so that you may be covered in the continuing 6502 Bibliography, and start an exchange subscription with us here at MICRO.]



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MICRO Club Circuit

Here is another installment of 6502-related clubs. The response to MICRO's effort to update this section has been terrific! We hope that all 6502 clubs will soon be presented here at some point.

This is a list of some of the newer clubs to have registered with MICRO, or that have sent us an update. If your club has been active, why not let us know what it has been up to?

If you are a newly formed group, have your representative register your group with us. In return for this registration we will send you a free one year subscription to MICRO for your club's library. Include information regarding your club's name, location, algorithm, publications, purpose, officers, membership total, contact person, and/or any other information you would like to share with the world! Your club will then automatically appear in any club update. If you are already registered, don't forget to keep MICRO up-to-date.

Address any correspondence to:
MICRO CLUB CIRCUIT
P.O. Box 6502
Chelmsford, MA 01824

If any information presented here is incorrect or outdated, please send us the correction to be made. We will remedy the situation in the next possible issue. We are striving to make the Club Circuit as helpful as possible.

Tulsa Apple User Group

Meets on second Tuesday of each month (7:30 p.m.) at:

High Technology Store
Tulsa, Oklahoma

John Shanks is the President of this group of 40 users. This group aims to exchange educational information. Contact:

Bill Dufresne
Tulsa Computer Society
P.O. Box 1133
Tulsa, OK 74101

MINI'APPLES

Meets on the third Wednesday of each month (7:30 p.m.) at:

Federal Savings & Loan
9th Avenue S
Hopkins, Minn.

Dan Buchler is President of this 150+ group and can be contacted at:

13516 Grand Avenue S
Burnsville, MN 55337

"We are now 2 years old and growing strong!"

THE APPLE CART

This is an international membership club which keeps in contact through a bi-monthly newsletter. *"Some objectives: Provide members with timely information about Apple Hardware and Software; provide members with a forum to share their experiences with and uses of their Apples; provide access to quality software by maintaining a software exchange; and to promote the creation of well written and well documented software."* Please address any letters (only) to:

C. Brandon Gresham, Jr.
Bin "R", Project 5810-1
Pasadena, CA 91109

MICROCOMPUTER INVESTORS ASSOCIATION

Meets as called at:

902 Anderson Drive
Fredericksburg, VA 22401

Jack Williams is the Administrator and can be contacted at the above address.

"Using microcomputers to make and manage investments."

Lincoln Computer Club

Meets as needed to schedule computer use and business. John Fultz is the advisor for this group. He may be contacted at:

Lincoln School
750 E. Yosemite Avenue
Manteca, CA 95336

"Educational aims. Group is made up of 7-8 students who use the computers before and after school."

Apple Creek

This is a new name for the Apple User's Group listed last month. They inform us that they have no dues, nor any officers but every third Thursday, 40 people show up to hear scheduled speakers. They are still at:

Computer Land of Walnut Creek
1815 Ygnacio Valley Road
Walnut Creek, CA 94598

Apple-Dayton

Here is another update for this club. It now meets on the second Thursday of each month (7:30 p.m.) at:

Bldg. 640

Wright-Patterson AFB

Bob Rennard, President. To contact this club, write to:

Dick Peschke, Sec.
4819 Leafburrow Drive
Dayton, Ohio 45424

"To acquire, distribute and organize programs to benefit members and to promote informed use of the Apple II systems in Dayton are some of this club's goals."

Iowa City Apple User's Group

Meets the third Tuesday of every month (7:30 p.m.) at:

Westinghouse Data-Score
Systems I-80 and IA-1

Contact David B. Thomas for more information:

134 Ravencrest Drive
Iowa City, IA 52240

The Boston Computer Society

Meets the fourth Wednesday of each month (except in July). Their mailing address is:

17 Chestnut Street
Boston, MA 02108

Jonathan Rotenberg is this club's President. Membership is expected to exceed 700 by this month.

"A total microcomputer resource center offering seven user groups, four publications, plus a variety of special events including seminars and general meetings with top authorities from around the world. Special groups dedicated to PASCAL and micros in education, also."

The Computer Network of K.C.

Meets on the second Sunday of each month (7:30 p.m.) at:

425 Volker Boulevard
Kansas City, Kansas

George Schiell is the Club President. Membership is currently at 90. For further information, contact:

Harold J. Schwartz
1251 Kansas Avenue
Kansas City, Kansas 66105

"EMS and Hardware and software. Not a TRS 80 Group."

OSIO National Headquarters

Meets on the first Tuesday of each month (7:30 p.m.) at:

Walter Johnson High School
Rockville, MD.

Wallace Kendall is President of this club which consists of 215 members, and still growing. National Headquarters is located at:

9002 Dunloggin Road
Ellicott City, MD. 21043

You may write them at the above address for further information.

"Encouraging local chapters. Study and promote public understanding of small computers. Our interest is centered on OSI machines. Active exchange program using data disks (no op systems or proprietary software). Starting an on-line hard-disk system which will permit exchange by phone. Several discount arrangements. OSIO is incorporated in the District of Columbia as a non-profit educational organization. We will be sponsoring seminars, tutorials, etc."

Kalamazoo Apple Computer User Society

Meets on the third Thursday of every month (7:30 p.m.) at:

Computer Room
455 W. Michigan Avenue
Kalamazoo, MI 49007

Gary Wilkins is President for this club of twenty-four. For information, contact Alex Ellingsen at the above address, or:

Gary Wilkins
3606 Thornhill Avenue
Kalamazoo, MI 49007

"Aid new and old Apple users with the full benefits and use of the Apple Computer."

Amateur Radio Research and Development Corp.

Meets on the first Monday of each month (7:30 p.m.) at:

Patrick Henry Branch Library

Vienna, VA 22180

Paul L. Rinaldo is President to this group of 260. You may write him for more information, at:

1524 Springvale Avenue
McLean, VA 22101

"Technical interests of ham radio and computing. Project in deaf communications."

Northwest Suburban Apple Users Group (NSAUG)

Meets at the Schaumburg Library in IL. Meetings are held on the first Saturday of each month. Don Fuller is President and can be written to at:

1140 Old Mill Drive
Palatine, IL 60067

"Promote knowledge, information and interest regarding the Apple II Computer. 135 members currently."

M3C2

Mid Michigan Micro Computer Club

Meets on the second Monday of each month at 7:30 p.m. Boasts of 103 members. For more information regarding this club which is open for all types of Microcomputers, please write to:

Earl Morris
3200 Washington
Midland, MI

"Meetings held at Delta College with the room numbers announced in each month's newsletter. Membership is informal and open to all interested in computers. Ages range from 10 to 65 and from novice to expert. Feature demonstrations of equipment and programs."

New England Apple Tree

This group meets on the third Wednesday of each month at 7:30 p.m. at the Mitre Corp. in Bedford, MA. Richard Sedgewick, President. More information can be requested by writing to:

Ruth Souza, Sec.
P.O. Box 2652
Woburn, MA 01888

"We publish a newsletter to keep our members up-to-date."

Fort Worth Apple Computer User Group

This club meets on the third Sunday of each month at 3:00 at either:

Micro Age Computer
1220 Melbourne
Hurst, TX

or
CompuShop
6353 Camp Bowie
Ft. Worth, TX

Marshall Martin is President to about 40 members. For current information, contact:

Lee Maudor
FWAUG
1401 Hillcrest Drive
Arlington, TX 76010

"We aim to provide a forum for exchange of information between users of Apple computers and to provide a medium for personal growth in programming, writing, design, and similar areas."

Dayton Microcomputer Association

The last Tuesday of each month is when this club gathers, at 7:30 p.m. Club location is at

2629 Ridge Avenue
Dayton, OH 45414

David Taylor is President for about 100 members. He may be written to at:

259 Aberdeen Avenue
Dayton, OH 45419

"Our purpose is to promote communication among computer hobbyists."

KIM Users Club The Netherlands

Meets on the third Saturday of every odd month, except July. The club's location is at:

Sinjeur Semeynsstr
781 1061 GM Amsterdam

For further information write to the club secretary, Anton Muller, at the above address.

"Knowledge and experience exchange on any 65XX based systems."

TRACE Toronto Region Assoc. of ComputerEnthusiasts

Meets at different times during the month at either the Ontario Science Centre or Humber College. Paul Cooling is President over about 60 members. For information regarding this club, please write to:

Ross Cooling
170 Redpath Avenue
Toronto, Ontario
Canada M4P 2K6

"Education regarding Microcomputers. Yearly dues and a monthly newsletter."

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Software for the Apple II



SUPER CHECKBOOK—a program designed to be an electronic supplement to your checkbook register. It's disk oriented and allows information to be displayed on the video screen or printer. It's super fast in sorting and retrieving information and totals. As an added bonus the program can optionally provide bar graphs to screen and/or printer. The program performs all standard check register operations, i.e. reconciliation. Minimum requirements are Disk II and only 32K RAM memory if Applesoft is in ROM; \$19.95.

ADDRESS FILE GENERATOR—a program that gives you complete control over a name and address file at a very low price. The power and flexibility of this software system is unmatched even in programs costing much more. You are allowed up to eleven fields in each record and you can search and sort on any of these fields. In fact you can sort up to three fields at once. The program contains a powerful print format routine which allows you to print out any field in any format you wish. Minimum requirements are Disk II and only 32K RAM memory if Applesoft is in ROM; \$19.95

WORLD OF ODYSSEY—an adventure game to which all others must be compared. It's by far the most complex game for the Apple II. It will probably drive you crazy and take several months of play to completely traverse this world. You have 353 rooms on 6 different levels to explore with myriads of treasures and dangers. The program allows you to stop play and to optionally save where you are so that you can resume play at a later time without having to repeat previous explorations. It's been called the best adventure game yet! Minimum requirements are Disk II with 48K RAM and Applesoft II in ROM; \$19.95.

REAL ESTATE ANALYSIS PROGRAM—The Real Estate Analysis Program provides the user with three features. a) A powerful real estate investment analysis for buy/sell decisions and time to hold decisions for optimal rental/commercial investments. b) Generation of complete amortization schedules. c) Generation of depreciation schedules. All three features are designed for video screen or printer output. In addition, the program will plot; cash flow before taxes vs. years, cash flow after taxes vs. years, adjusted basis vs. years, capital gains vs. years, pre-tax proceeds vs. years, post-tax proceeds vs. years, and return on investment (%) vs. years. Minimum requirement Applesoft II, 16K; \$14.95.

DYNAMAZE—a dazzling new real-time game. You move in a rectangular game grid, drawing or erasing walls to reflect balls into your goal (or to deflect them from your opponent's goal). Every ball in your goal is worth 100 points, but you lose a point for each unit of elapsed time and another point for each time unit you are moving. Control the speed with a game paddle: play as fast as ice hockey or as slowly and carefully as chess. Back up and replay any time you want to; it's a reversible game. Integer Basic (plus machine language); 32K; \$9.95

ULTRA BLOCKADE—the standard against which other versions have to be compared. Enjoy Blockade's superb combination of fast action (don't be the one who crashes) and strategy (the key is accessible open space—maximize yours while minimizing your opponent's). Play against another person or the computer. New high resolution graphics lets you see how you filled in an area—or use reversibility to review a game in slow motion (or at top speed, if that's your style). This is a game that you won't soon get bored with! Integer Basic (plus machine language); 32K; \$9.95.

What is a **REVERSIBLE GAME**? You can stop the play at any point, back up and then do an "instant replay", analyzing your strategy. Or back up and resume the game at an earlier point, trying out a different strategy. Reversibility makes learning a challenging new game more fun. And helps you become a skilled player sooner.

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The MICRO Software Catalog: XXI

Software announcements for the 6502 based systems

Mike Rowe
P.O. Box 6502
Chelmsford, MA 01824

Name: **ISAM-DS**
System: **Apple II**
Memory: **3K plus index table storage**
Language: **Applesoft**
Hardware: **Apple II, Disk II**

Description: ISAM-DS: integrated set of 15 utility routines: facilitate creation & manipulation of indexed files. Records on indexed files quickly retrieved randomly or in sequence. Each record identified by key data value which does not have to be part of record, doesn't have to be unique for each record. Partial key values may be used in retrieving records. Interface between ISAM-DS and an Applesoft program through single entry point (GOSUB) and 9 variables. Files created, opened, closed, copied, erased. Records written, read, changed, deleted. File space freed by deleting record automatically reused when another record added. No need to clean up file due to update activity. ISAM-DS must for writing business systems for the Apple II and equally useful in personal programs or learning index-sequential file processing techniques.

Copies: **Just released**
Price: **\$50.00** (Texas residents add 5% sales tax.)
Includes: integrated set routines, documentation for routines, & sophisticated mailing list program: demonstrates ISAM-DS capabilities. Append routines for DOS 3.1 and 3.2 also included. Append routines used to join the ISAM-DS package to an Applesoft program.

Author: **Robert F. Zant**
Available: **Decision Systems**
P.O. Box 13006
Denton, TX 76203

Name: **Zero Based Budgeting**
System: **Apple II or Apple II plus. Printer optional.**
Memory: **32K**
Language: **ROM or cassette Applesoft**

Description: Program allows user to create zero based budget & store data on tape for later recall. 10 projects, 16 costs centers allowed. Independent \$ rates for each cost entered with man-yr entries for each specific combination. Once data entered, numerous modify routines are available in menu format for alteration of data. Project Priority feature included with accumulative expense listings show how much expense occurring as each project is added. Cost & human resource totals shown for each cost center & project independently. Particularly useful program for both sm & lg businesses. Contains useful features for personal budgeting. Hard copy output provided in software if suitable interface available.

Copies: **Available now**
Price: **\$12.95 Postpaid**
Includes: **Cassette tape, loading instructions, description and example.**

Author: **Neil A. Robin**
Available: **Tech-Digit Co.**
21 Canter Lane
Sherwood, OR 97140

Name: **Major League Baseball**
System: **Apple II**
Memory: **48K and ROM Applesoft**
Language: **Applesoft**
Hardware: **Disk**

Description: Manage Major League Baseball teams & make all decisions. Includes 1979 teams and utility programs to create and maintain team files. HIRES display.

Copies: **Just released**
Price: **\$25.00**
Author: **Stan Erwin**
Available: **5410 W. 20th Street**
Indianapolis, IN 46224

Name: **Subroutine Library**
System: **UK 101, based on OSI Challenger**
Memory: **8K**
Language: **Microsoft Basic and Machine Code**
Hardware: **UK 101/OSI Challenger**

Description: Library of useful subroutines, for screen formatting. Fast genrlized histograms, vert (1/8 pixel res) and horiz (1/2 pixel), screen clear/fill with character instantly, instant blocks/lines of any character; place text anywhere on screen, horiz or vert; keybd control w/o 'INPUT'; save variables for chaining to new program; hex/decimal conv with error flags; etc. The UK 101 identical to Challenger but screen format is 48X16. Elementary convers of screen routines will be needed. Machine code routines for fast writing reside is top 256 bytes of memory. Further routines under development, e.g. save/read text on cassette. Also original games available.

Copies: **25 sold in one month**
Price: **\$12.00**
Author: **J. M. Leach**
Available: **Dola Software**
117, Blenheim Road
Deal, Kent, England

Name: **MAILBAG**
System: **Apple II or Apple II Plus**
Memory: **32K with ROM Applesoft or the Language Card, 48K with RAM (disk) Applesoft**

Language: **Applesoft and machine language**
 Hardware: **Apple II, Disk II (a printer with Serial or Parallel interface desirable. Supports the Paymar Lower Case Adapter chip)**

Description: a menu-driven, disk based mailing list database sys. Fully supports UPPER & lower case letters from standard APPLE keybd, displays true l.c. when running with Paymar LCA, or with l.c. in INVERSE video otherwise. Provides easy-to-use method of screen formatting for data entry, right & left-arrow key editing. Dual-disk operation fully supported as is ability to do DOS CATALOG w/o leaving sys. Besides normal name, addr, & phone # lines, 2nd/company name available as is optional comments/code line. User may search database on any of 6 keys & sort entire data set on any of 6 sort keys. Sorting via fast Shell-Metzner sort in Basic, or MB can interface easily to ultra-fast mach lang sort program Ampersort II. Special feature: ability to automatically merge mail list with form letters created by TXT/ED 2.0 Word Proces Sys. Most popular printers may be easily interfaced, printing options incl full database printouts, standard mail labels, special 1-line name & phone # list, + form letters.

Copies: **Just Released**
 Price: **\$34.99 on disk**
 Includes: System disk & documentation manual with instructions for printer interfacing and sort method modifications.
 Author: **Gerald H. Rivers**
 Available: G.H. Rivers
 P.O. Box 833
 Madison Heights, MI 48071

Name: **ASTAT 79**
 System: **APPLE II or APPLE II Plus & Disk II**
 Memory: **32K with ROM—48K without**
 Language: **APPLESOFT II**

Description: An integrated statistical processor; subset of popular main-frame packg P-STAT 78. Calculates descriptive statistics (min, max, sum, mean, standard deviation, & counts), freq distributions (count, %, & cumulative %), complete bivariate tabulations (count, row column total %, cell expected-valued, cell Chi-square), correlation matrices (Pearson correlations, pair-wise deletion of missing data, good n's), path analysis (multiple regression Beta weights & R-square). Also contains complete variable trans lang. Logic driven algebraic file modifications can be permanent or applicable to specific procedures. Missing values understood by all procedures. Supports complete dat-base mangement functions such as formatted listings of

files, alphabetic fields, file merging (up-down or left-right) & more. All files standard DOS text files.

Price: **\$100.00 complete — \$20.00 each procedure.**
 Includes: One diskette plus sample program & language reference manual. Machine readable manual available at extra cost. User's manual available soon.
 Author: **Gary M. Grandon, Ph.D.**
 Available: Rosen Grandon Associates
 296 Peter Green Road
 Tolland, CT 06084
 or
 The Roper Center, Inc.
 University of Connecticut
 Box U-164R
 Storrs, CT 06268

Name: **List CTRL**
 System: **Basic Apple II or Apple Plus**
 Memory: **32K or 48K**
 Language: **Assembly (.8K)**
 Hardware: **Disk II, Applesoft ROM**

Description: This utility allows you to control the listout of a program to the screen. The Apple game paddles are utilized to control an adjustable pause between each line of text and/or character outputted to the screen. The speed of text output to the screen can be changed at any time with the paddle controls to accommodate a comfortable reading level. The game paddle button can be pressed at any time during a listout. This will stop the listout and allow you to study the page of text, take notes, etc. By pressing the spacebar key, the next page of text (20 lines) will be output to the screen and will stop. Each succeeding press of the spacebar will display the next page of text. If the game paddle button is pressed again, the page listout is disabled and the listout will continue at the speed set by the game paddles. The ESC key may be used at any time to stop the present listout and allow a new listout of the program; any portion of it, or you can exit List Ctrl. Upon exit, List Ctrl may be retained in memory; called back with the Ampersand key for later use; or aborted. Regardless of the usage, DOS is never disabled.

Copies: **Many**
 Price: **\$14.95**
 Includes: User Documentation and Diskette
 Author: **Frank D. Chipchase**
 Available: Soft Ctrl Systems
 P.O. Box 599
 West Milford, NJ 07480

Name: **CHAT (Challenger Terminal)**
 System: **OSI Challenger-1P and**

Memory: **Superboard II 4K**
 Language: **Machine Code and Basic**
 Hardware: **Modem and RS232 modification**

Description: An intelligent terminal with the ability to directly transmit data from cassette and transfer received data to cassette via an internal buffer. This buffer automatically expands on systems with more than 4K to allow more data storage at a single time. Full/half duplex modes; selectable parity and stop bits. CHAT has a very unique feature—46 user definable 6-state keys capable of generating all ASCII characters. The user may be content with the standard ASCII keyboard layout that CHAT comes with or may tailor it to his/her needs. All key changes are stored when CHAT is saved on tape. Also, the keyboard has the auto-repeat feature and a break key.

Price: **\$24.95**
 Includes: **Cassette and User Manual**
 Author: **Charles A. Shartsis**
 9308 Cherry Hill Rd., No. 812
 College Park, MD 20740

Name: **FLEXIPAY**
 System: **APPLE II**
 Memory: **48K with ROM or RAM**
 Applesoft
 Applesoft
 Hardware: **Apple II Disk II, Serial Interface printer**

Description: FLEXIPAY is a versatile payroll system for the APPLE II. Payroll masterfiles for any number of companies may be created, edited and fully maintained. Processes weekly, monthly, salaried, hourly, commissions, etc. Automatic group insurance deductions plus two other auto deducts (credit union, etc.) of your choice. All taxes computed. Pay and nonpay adjustments (advances, etc.). Output includes masterfile, payroll summary with current, QTD and YTD data for each employee, company totals. Labor summary, tax summary, departmental cost summary, plus worksheets for next pay period. Fast, easy entry, self-verified. Prints paychecks and stubs for 40 (RAM Applesoft) or 60 (ROM Applesoft) employees. Prints W-2's and 941's for state use. Formatted checks and stubs available—have your bank no. printed or we will handle. Start your own service bureau!

Price: **\$75.00**
 Includes: **System disk, full instructions.**
 Author: **S. Prater, CPA**
 Available: INDATA, Inc.
 8222 Antoine, suite 103
 Houston, TX 77088

Name: **Stock Market Option Account**
 System: **Apple II or Apple II Plus**
 Memory: **32K with Applesoft ROM 48K with Applesoft RAM**
 Language: **Applesoft II**
 Hardware: **Disk II, 132 column printer (optional)**

Description: The program stores and retrieves virtually every option traded on all option exchanges. A self-prompting program allowing the user to enter short/long contracts. Computes gross and net profits/losses, and maintains a running cash balance. Takes into account any amending of cash balances such as new deposits and/or withdrawals from the account. Instantaneous readouts (CRT or printer) of options on file, cash balances, P/L statement. Includes routine to proof-read contracts before filing.

Price: **\$19.95 plus \$2.00 (P&H) first class**
 Includes: **Diskette and full documentation**
 Available: **Mind Machine, Inc. 31 Woodhollow Lane Huntington, NY 11743**

Name: **Program Writer**
 System: **Apple**
 Memory: **32K minimum**
 Language: **Applesoft**
 Hardware: **1 Disk Drive**

Description: This program was written to speed up the process of writing advanced business programs. It works as a data management system, but also writes disk statements as permanent line number, if requested. Supports 20 fields per entry, searching or sorting by any field, generating reports, packing numbers to increase disk space, plus many more. Use for inventory, checks, phone numbers, etc. Simple to use with instructions.

Copies: **Just released**
 Price: **\$29.95**
 Includes: **One diskette, instructions and examples.**
 Author: **Wilford Niepraschk 59 Thurston Avenue Virginia Beach, VA 23455**

Name: **Data Factory 2.2**
 System: **Apple 1 or 2 disk drives or Hard disk (Corvus.Lobo) optional printer**
 Memory: **48K RAM ROM card**
 Language: **Language card Applesoft**

Description: A data base file program of unique utility. It allows the user to create a file consisting of desired categories (columns or fields) in which various sorting and printing procedures can be accomplished. The program can be copied, lists for modification. It uses one or two

disk drives and operates with or without a printer. Printer options are on a separate program and allows you to select printer slot, line length, indentation, lines per page, line feeds for single or roll-fanfold paper. Page numbers can be printed, if desired. These printer options can be easily changed on a permanent or temporary basis.

Price: **\$100.00 (Hard disk version slightly more).**
 Includes: **Disk, program and 26 page manual.**
 Author: **William Passauer**
 Available:

**Andent Inc.
 1000 North Ave
 Waukegan, IL 60085**

Name: **L.I.S.A. (Lazer Systems' Interactive Symbolic Assembler)**
 System: **APPLE II**
 Memory: **V1.5C: 48K, V2.0: 64K**
 Language: **6502 Machine Language**
 Hardware: **Apple II Disk II, Language Card (V2.0), optional: Dan Paymar Lower Case mod, 80 column printer, Mountain Hardware Rom-writer, (V2.0), Double Vision 80X24 display board (V2.0)**

Description: An interactive 6502 assembler for the Apple II microcomputer. Syntax checkline is performed at edit time resulting in immediate feedback for all syntax and addressing mode errors.. Designed specifically for the Apple II, LISA incorporates several special features such as the ability to store data in inverted or blinking mode, built in disk operations, etc. LISA is the fastest assembler on any personal computer. At 20,000 lines per minute, (assembly time) it is four to ten times faster than comparable assemblers on the Apple II. A typical 1000 line program only requires 3 seconds to assemble. Compare this to the 30 seconds to three minutes required by other Apple assemblers to assemble the same file.

Price: **\$34.95, (V1.5C); \$49.95 (V2.0)**
 Includes: **Diskette with software; 100 page documentation reference manual.**
 Author: **Randall Hyde, Lazer Systems**
 Available: **Programma International 3400 Wilshire Blvd. Los Angeles, CA 90010**

Name: **Soft-Sonic**
 System: **Apple II or Apple II Plus (except for speech program)**

Memory: **32K**
 Language: **SS 6502 Assembly Language; Home control, timing—Applesoft; Home control, speech—Integer**
 Hardware: **Home Control, speech-Heuristics speech lab, Ultra sonic transducer and cable (included with programs) Disk highly recommended.**

Description: Three programs to provide a reliable and inexpensive means to interface a BSR (Sears) Home controller. SS is a reliable machine language subroutine that produces all the codes, tones and delays required to communicate with the BSR. Home Control, Speech provides for verbal control of up to ten lights and appliances with vocabularies for two persons automatically saved and exchanged from disk. Home control, timing has an internal software clock and allows for several hundred NAMED sequences to be executed or repeated so that 16 remotes may be turned off, on, dimmed, etc. automatically. Each sequence can be for several seconds or several weeks, depending upon your requirements. No modification of your Apple is required as the transducer (included) plugs into the game I/O.

Price: **\$39.95 plus \$2.00 (P&H) GA residents add 4% sales tax.**
 Includes: **SS Home Cntrl, spch, HC, timing, SS Relocator, all on disk (tape by request) and the ultra sonic transducer complete with cable.**
 Author: **John Blakenship**
 Available: **B.A.C.E. P.O. Box 52785 Atlanta, GA 30355**

While we have been lenient in the past regarding the length of the entries in the Software Catalog, we must now insist that future entries be kept as brief as possible. We think that twelve to fifteen lines in the "description" part of the entry should keep it about right. The other parts, as long as needed.

We now have so many entries backed up, that we feel this policy is only fair to give everyone 'equal time'. We will be forced to edit, or return any entries that we judge too long.

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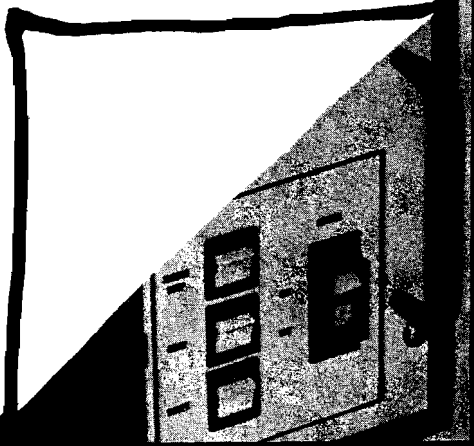
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Continuing bibliography of 6502 related material

Dr. William R. Dial
438 Roslyn Avenue
Akron, OH 44320

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John, Norma M., "Pascal MASTERMIND," pg. 8-15.
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An Apple program which writes its own DATA statements.

Figueras, John, "How to do a Shape Table Easily and CORRECTLY," pg. 11-22.
A tutorial and program to create shape tables, for the Apple.

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Discussion of the organization of PET BASIC and a relocation program.

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Discussion of the OSI Superboard II.

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Four programs to enhance the capabilities of the basic AIM 65.

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Interfacing a VIA 6522 to your PET is simple.

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A bigger display for your PET when playing the Game of Life.

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A simple technique to change the program storage space when using Applesoft.

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Have a clock and calendar running in your SYM at the same time you are running a program.

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Care to take a speed typing test on your Apple???

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No microcomputer is better than its RAM memory. Here is a test for any 6502 system.

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Two methods for adding counter capability to your 6502 machine. Hardware and software.

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An Applesauce program for the Apple.

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A business program for the Apple.

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Gauthier, Joe, "Report from Joe," pg. 11.
Program for generating "officialesse."

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A program to calculate prime numbers on the PET.

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Precautions to use on the PET.
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Discussion of Pascal.
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Anon, "December DOM," pg. 4.
The December Disk of the Month will be a great Holiday DOM and will contain Bruce Tognazzini's CATTLE CAR.
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Further discussion of the LISA Assembler, for the Apple.
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Simple routine modified from the "Red Book" for Applesoft.
- Carlisle, Rod, "Put the HEX on Hexadecimal," pg. 9.
Tables for converting Hexadecimal to Decimal.
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No doubt you need help if you are trying to run Pascal with only one disk drive. Well, here it is!
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Results of a very interesting survey of Apple owners.
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Foens, Bob, "GEEJO," pg. 4.
Two Holiday season programs for the Apple.
Thompson, Colleen, "Hunt the Wumpus—Revisited," pg. 6-8.
Hunt the Wumpus with crooked arrows which ricochet—a new version of an old game.
Wagner, Roger, "A Fast GR Screen Clear," pg. 9.
A program utilizing the Monitors binary move routine which clears the low resolution screen very quickly, on the Apple.
Knaster, Scott, "Solving the RESET Problem," pg. 14.
No one likes the RESET Key! New uses make it lovable!
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A discussion of the "mystery key," the Ampersand. This key on the Apple can be very useful. For instance, the new command—READAT.
Wagner, Roger, "An Unlikely Character," pg. 18.
How to generate some real unlikely special characters on the Apple keyboard using fancy fingering.
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Review of a new package by SAT TRAK INYL.
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Walking animation made simple on the Apple.
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A Pascal TURTLEGRAPHICS PROGRAM, Assembly Language Program for a clock routine, etc.
Yob, Gregory, "Personal Electronic Transactions," pg. 146-149.
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Busdiecker, Roy, "Power-Root," pg. 19-20.
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Search through your PET program for a given line using this routine.

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What a Compiler is, how it works and a discussion of a Basic compiler currently under development.

Reich, Dr. L. S., "Human Physiological Parameters," pg. 15-19.
Program calculates the proper weight for an individual as a function of height, body build and sex. In Applesoft.

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A routine which makes it simple to Edit the Apple screen and save the screen image on disk.

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About eighty new references are covered.

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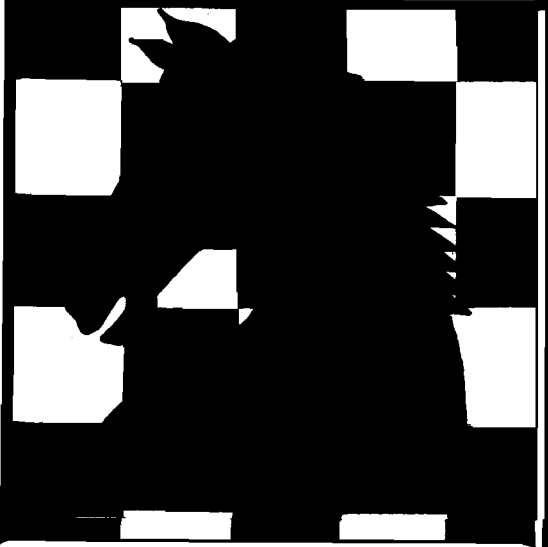
The **Cruncher** removes REM statements and compresses code in Applesoft programs. The **Prompter** is a powerful data entry subroutine that can handle both string and numeric data. Options include using commas, decimal points, and leading zeros with right-justified numerics. A maximum field length can be specified to prevent overflow in both numeric and alphanumeric fields. The **Diskette Copy** formats an output disk, copies each track, and verifies that the output matches the input. PLUS FOUR MORE UTILITIES TO AID YOUR OWN PROGRAMMING. Suggested Retail Price for **Dakin5 Programming Aids** is \$39.95.

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See your Apple dealer or contact Dakin5 Corporation, P.O. Box 21187, Denver, Colorado 80221. Telephone: (303) 426-6090. Dakin5 developed the business application software **The Controller**™ for Apple Computer Inc.

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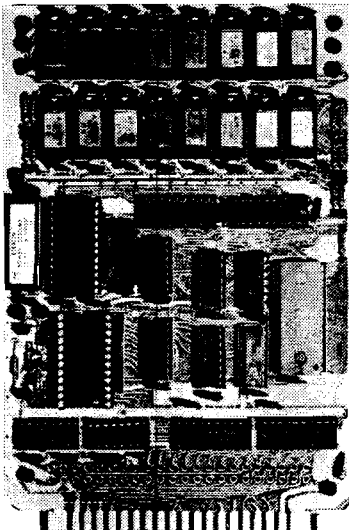


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[A limited number of back issues are still available from number 7 to 18 and 20 to current. There are no 19's left.]

The BEST of MICRO Volume 1 contains all of the significant material from the first six issues of MICRO, from October/November 1977 through August/September 1978. This book form is 176 pages long, plus five removeable reference cards. The material is organized by microcomputer and almost every article is included. Only the ads and a few 'dated' articles have been omitted. [Now in third printing!]

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For a free copy of the Index for Volumes 1, 2, and 3, please send a self-addressed, stamped envelope to:

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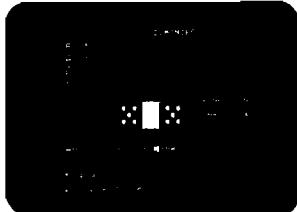
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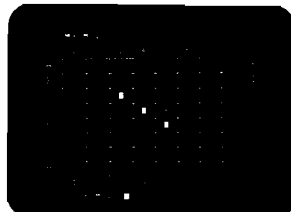
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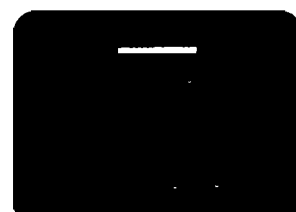
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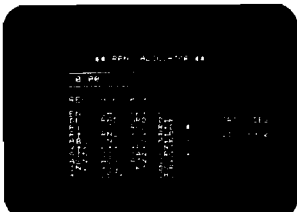
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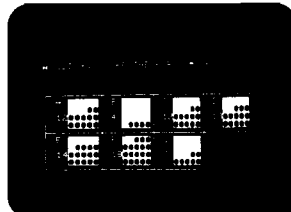
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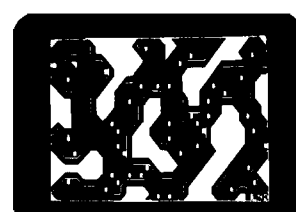
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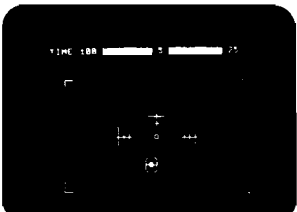
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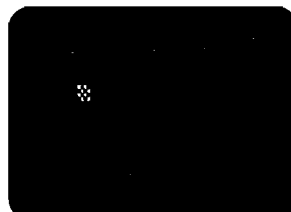
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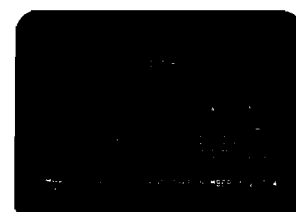
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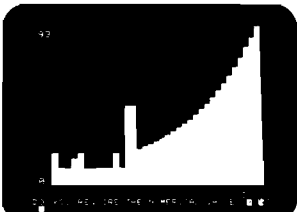
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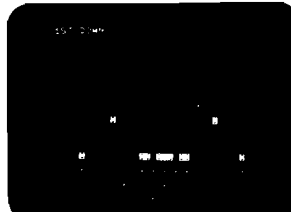
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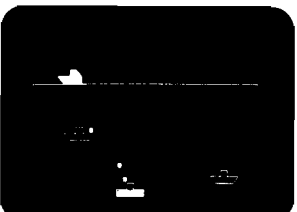
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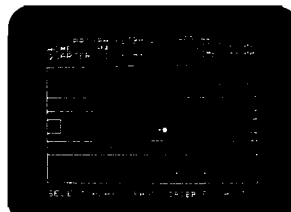
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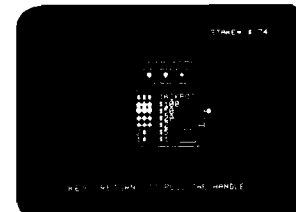
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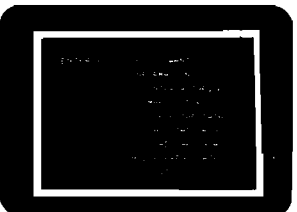
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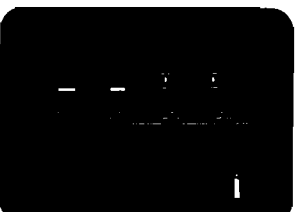
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Business Applications

The C8P DF utilizes full size 8" floppy disks and is compatible with Ohio Scientific's advanced small business operating system, OS-65U and two types of information management systems, OS-MOMS and OS-DMS.

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The C8P DF incorporates a real time clock, FOREGROUND/BACKGROUND operation and 16 parallel I/O lines. Additionally a universal

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