6502 USER NOTES

NO.14 $2.50

EDITORIAL

From the feedback I've received concerning issue #13, most of you were very happy about the "new" format so things will stay pretty much the same. A good number of comments specifically mentioned their satisfaction with the "language lab" so we may expand on it a bit in future issues. Lots of good stuff in store for you BASIC, FOCAL and TINY BASIC users. Thanks to all of you who responded to my questions on modifying BASIC to skip the initialization messages. As you will soon know, that question and many others will be answered in this issues' BASIC column. Also, thanks to Dick Grabowski of HDE and Bob Kurtz of Micro-Z, we now have a new command for BASIC.

A number of you have been asking for some terminal-oriented software so we have modified the original APPLE disassembler for the KIM. You'll need more memory, but if you have a terminal you're finding that out anyway.

Those of you with hard copy will no doubt enjoy the BANNER program. The present character set is designed for a 40 column printer but can easily (?) be re-designed for wider terminal widths. When you do come up with a new character set, send it in so the rest of us can enjoy it. Send it in on a cassette to make life easier for us and we'll publish it and/or offer it on cassette, depending on its design. There's enough info in the article to enable you to design your own character set and further info can be gotten from the Kilobaud article.

SUBMITTING ARTICLES

Since all articles will be retyped they need only be readable. Typing it would, of course, guarantee readability. Program listings, on the other hand, may not be retyped so, if at all possible, use white paper and a fresh ribbon on your printer. If there's no way you can generate an original source listing, then a handwritten source listing with MOS mnemonics, and labels of up to six characters, (don't forget to use labels when referencing zero page locations) will be satisfactory. Comments should be preceded by a semicolon.

This will make it easy for me to assemble your program for publication. Disassembler output is not very satisfactory except when heavily commented, labeled and all zero page registers identified by name.

Perhaps the best way to submit program source listings would be to send a cassette of the assembler source file and I can then assemble it and run a listing on my Decwriter. I Can assemble source files from either the Micro-ade assembler (Peter Jennings) or the MOS/ARESCO/HDE assemblers. If you send a S.A.S.E.,I'll return your cassettes. It would be wise to dump two copies of the file to cassette just in case.

I can read most of the Hypertape-recorded cassettes I receive once I adjust the azimuth of the cassette head for the highest audio level while reading the program. I think this head adjustment problem has probably accounted for most of the tape interchange problems I've been aware of. The machines I use to make the newsletter cassettes have been adjusted as close as possible and 30 seconds of synch characters precede the program for setting up your equipment. So far, we have not had any cassettes returned, so we must be doing something right.

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BACK ISSUE AVAILABILITY

"Official" reprints of USER NOTES 1-12 are now available from Mark Kantrowitz, 15 Midway Ct., Rockaway NJ 07866. Prices are $5.00 for issues 1-6 or 7-12 (1st Class in N America)- $10.00 for issues 1-12 (1st Class in N America)- $13.00 for issues 1-12 (overseas) U.S. Funds only.

LET THE BUYER BEWARE!!

Those of you who have been around this industry for awhile know by now that just 'cuz somethings advertised doesn't mean that it really exists.

I am very interested in hearing about your experiences with any of the advertisers in USER NOTES.

When purchasing hardware or software, it makes alot of sense to purchase the documentation ahead of time to see what you're getting into. The quality of documentation can, prove to be a good indicator of the company's performance in other areas pertaining to that product.

On the other hand, do be reasonable. Don't expect a 60 page manual to accompany a $5 or $10 software package. I'm really referring to products of medium or high complexity such as some Assemblers or high-level languages, floppy-disc drives, prom programmers, video boards etc.

For instance, are there detailed instructions for getting the product running on your system? Does the product need some non-standard hardware or software? Are there enough examples to make operation fairly straightforward? What if you have problems? Are there some trouble shooting hints in the manual? How 'bout a phone number to call if you have problems which you can't handle? For items which may cost from several hundred to several thousand dollars, it would be a good idea to call the company with some real or made-up questions just to see what kind of response you get.

Are you treated courteously? Do you get connected to someone who can answer your question? (If the right person doesn't happen to be in the office when you call, don't expect them to return a long distance call.)

It can get pretty lonesome out there when you've got a product that isn't performing and a company that ignores you. It's better to find out in advance how a company treats its customers. If something breaks, how will they back you up?

When you shop around for something big (like a floppy, for example) you should understand that price alone should not be THE determining factor. Other things to consider include: What kind of software comes with it? Will it interface easily with the particular high-level language I will want to use? What kinds of software can be used with it-any optional packages from the manufacturer? Can I interface the floppy system easily to some non-standard hardware I may want to add? How easy will it be to incorporate some improved software which gets released at a later date from the manufacturer?

(RAM based software that is brought in by means of a simple bootstrap program is generally much easier to upgrade than a ROM based operating system). Can the system software be backed-up on an extra disc? What will the manufacturer be offering in the next year or so? Do his plans sound reasonable? What else has he done? Past performance generally indicates future performance. If you're looking for the "cheapest" product-keep in mind that the manufacturer of the "cheapest" product probably can't afford to support his product next year. INVESTIGATE FULLY BEFORE YOU BUY!!!!!!

KIMSI USERS

Apparently Forethought Products, makers of KIMSI, have given up any plans to put out a newsletter of KIMSI information. I know there are alot of you out there so how 'bout if we have a section of USER NOTES just for you?

SOFTWARE FEATURES

KIM-1 BANNER

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If your KIM, SYM, or AIM system is hooked up to a printer or teletype get ready to have some fun! In the January 1979 issue of Kilobaud there was an article on page 64 called "Say it with Banner". This program prints out giant characters on your printer. There were three problems with the program:

1. It is written in 8080 code.
2. It uses octal notation.
3. It uses almost 8K of memory.

I took the general concept of printing large characters and wrote an orginal program that has the following features:

1. Written in 6502 code.
2. I/O independent.
3. Uses HEX notation.
4. Only uses 2K of memory.
5. Relocatable data tables.
6. Easy user modification of character sets.

Let's talk about the I/O configuration first. Location 2004 and 2005 defines the Input character routine location for your system. If your terminal echos your input change 2003 to 4C. The character output routine location for your system is defined by locations 2007 and 2008. Your output routine must do the following:

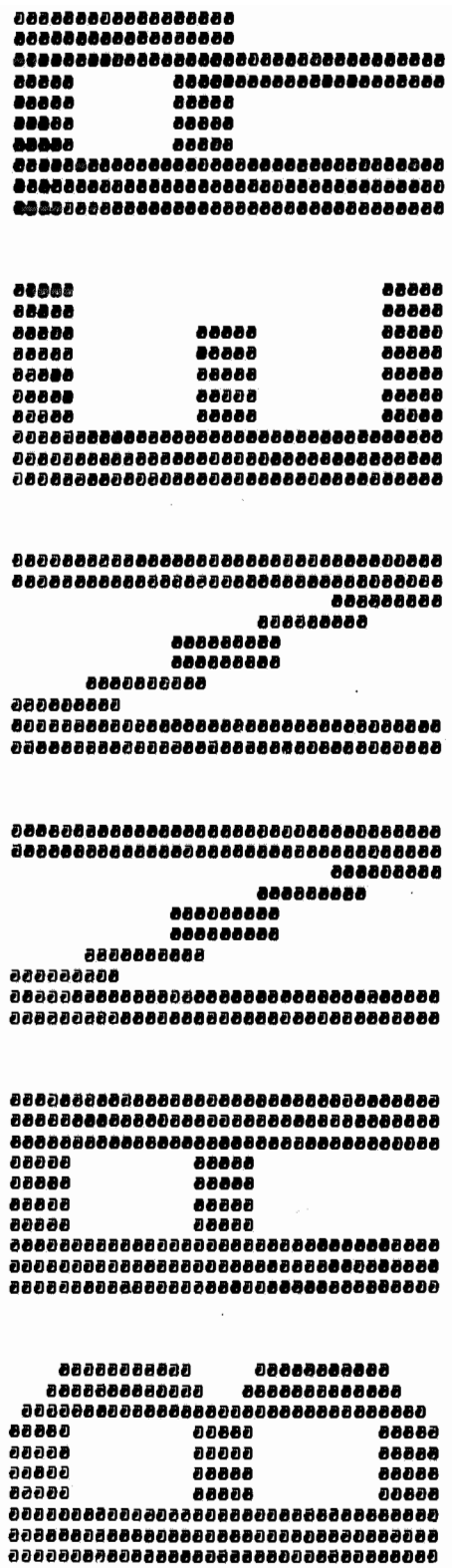
1. Provide a line feed if necessary.
2. Provide null characters if necessary.
3. Must preserve the X, Y, and accumulator registers.

Text can be stored anywhere in memory and is defined by locations 200C and 200D. The text string can be as long as you want as long as you don't run out of memory. The data tables can be stored anywhere in memory as long as the starting address of the tables is stored in 2009 and 200A. SYM users will want to store the tables right after the program. The print character is defined in location 200B. Use the HEX equivalant of the ASCII character you want. The program is set up to use an @. I will explain later on how to make up your own characters or modify some of the ones I made up. To use the program start at 2000 and GO. You will see a prompt (>>). Type in the text you want printed out. The program treats a carriage return as a space so take note. You terminate the text input with an @. If you typed in all valid characters you will see "@ o k" printed. Get your paper ready and type a carriage return to start the printing. If you type an illegal character you will see "@ " with the illegal characters sandwiched between the @ and the . Retype the text using only legal characters. At the end of the printout the program will prompt for more text. The legal characters are A thru Z, 0 thru 9, space, c/r, and the following characters: * . - + : ! ; ? $, . My characters are 10 rows by 35 columns. Obviously this is too big for the AIM printer. Don't worry, you can make up your own character set to work on the AIM. To create your own character set just follow these simple rules:

1. Always store ff at the end of the tables.
2. The first BYTE should be the HEX equivalent of the ASCII character.
3. The second BYTE should be the HEX number of data Bytes.
4. Carriage returns are defined by EE.
5. Store the configuration of the character in a serial manner.
6. A "print spaces" data Byte is defined by Bit 7 being set to zero and Bits 0 thru 6 set to the number of spaces you want printed. Example: 07 would print 7 spaces.
7. To print a mark (or a character) set Bit 7 to one and Bits 0 thru 6 set to the number of marks. Example: 87 would print 7 @'s.

Maybe this will help you understand a little better. In order to print an "1" (one) that is 15 columns by 7 rows wide, just put this in the tables: 31 0A EE EE 8F EE 8F EE 8F EE EE EE. The 31 is the HEX equivalent of ASCII character one. The 0A is the number of data Bytes. Then I print 2 carriage returns, 3 rows of 15 characters and 2 more carriage returns. Hope you enjoy this program. If you want to modify any of my characters you can find their location by storing the character in 0004, then call the find character subroutine. The character's location plus 2 will be stored in 0000 and 0001.

```
0010  2000                  ;KIM-1 BANNER PROGRAM
0015  2000                  ;WRITTEN BY JIM ZUBER 12/23/78
0020  2000
0025  2000                        *=$0
0030  0000            PNTL    *=*+1
0035  0001            PNTH    *=*+1
0040  0002            BUF1    *=*+1
0045  0003            BUF2    *=*+1
0050  0004            TEMP    *=*+1
0055  0005            TEMPX   *=*+1
0060  0006            TEMPY   *=*+1
0065  0007
0070  0007            ;KIM I/O
0075  0007            GETCH   =$1E5A
0080  0007            OUTCH   =$1EA0
0085  0007            CRLF    =$1E2F
0090  0007
0095  0007            EOS     =$40            ;END OF STRING CHAR
0100  0007
0105  0007                        *=$2000
0110  2000  4C 0E 20  STAR    JMP OVER
0115  2003  4C 2C 21  INV     JMP INPT        ;INPUT ROUTINE
0120  2006  4C 34 21  OUTV    JMP OUTC        ;OUT VECTOR
0125  2009  00        TBLL    .BYTE $00       ;TABLE LOW
0130  200A  30        TBLH    .BYTE $30 22    ;TABLE HIGH
0135  200B  40        PRCH    .BYTE $40       ;PRINT CHAR
0140  200C  00        BUFL    .BYTE $00 50    ;BUFFER LOW
0145  200D  40        BUFH    .BYTE $40 21    ;BUFFER HIGH
0150  200E
0155  200E  D8        OVER    CLD
0160  200F  A0 00             LDY #0
0165  2011  20 FA 20          JSR INTB        ;INPUT TEXT
0170  2014  A9 3E             LDA #'>         ;PROMPT CHAR
0175  2016  20 06 20          JSR OUTV
0180  2019  20 06 20          JSR OUTV
0185  201C  A9 0D             LDA #$0D        ;SEND A CR
0190  201E  20 06 20          JSR OUTV
```



```
0195  2021  20 03 20  CHAR   JSR INV          ;INPUT STRING
0200  2024  91 02             STA (BUF1),Y
0205  2026  C9 40             CMP #EOS        ;END OF STRING?
0210  2028  F0 06             BEQ CHEK
0215  202A  20 10 21          JSR INCB
0220  202D  4C 21 20          JMP CHAR
0225  2030  20 FA 20  CHEK   JSR INTB         ;CHECK CHARS
0230  2033  A0 00      LOP3   LDY #0
0235  2035  B1 02             LDA (BUF1),Y
0240  2037  C9 40             CMP #EOS        ;END STRING?
0245  2039  F0 17             BEQ OK
0250  203B  85 04             STA TEMP
0255  203D  20 C9 20          JSR FDCH        ;FIND CHAR
0260  2040  C9 FF             CMP #$FF        ;IS IT BAD?
0265  2042  D0 08             BNE LOP4
0270  2044  A5 04             LDA TEMP
0275  2046  20 06 20          JSR OUTV        ;START OVER
0280  2049  4C 00 20          JMP STAR
0285  204C  20 10 21  LOP4   JSR INCB
0290  204F  4C 33 20          JMP LOP3
0295  2052  A9 4F      OK     LDA #'O         ;PROMPT "OK"
0300  2054  20 06 20          JSR OUTV
0305  2057  A9 4B             LDA #'K
0310  2059  20 06 20          JSR OUTV
0315  205C  A9 0D             LDA #$0D
0320  205E  20 06 20          JSR OUTV
0325  2061  20 03 20          JSR INV         ;WAIT FOR KEY
0330  2064  20 FA 20          JSR INTB        ;READY TO PRINT
0335  2067  A0 00      LOP6   LDY #0
0340  2069  B1 02             LDA (BUF1),Y
0345  206B  C9 40             CMP #EOS        ;END?
0350  206D  D0 03             BNE LOP7
0355  206F  4C 00 20          JMP STAR
0360  2072  85 04      LOP7   STA TEMP
0365  2074  20 C9 20          JSR FDCH        ;FIND CHAR
0370  2077  20 8B 20          JSR PNTC        ;PRINT IT
0375  207A  A9 0D             LDA #$0D        ;3 ROWS
0380  207C  20 06 20          JSR OUTV
0385  207F  20 06 20          JSR OUTV
0390  2082  20 06 20          JSR OUTV
0395  2085  20 10 21          JSR INCB        ;INC BUFFER
0400  2088  4C 67 20          JMP LOP6
0405  208B
0410  208B  A0 00      PNTC   LDY #0          ;PRINT CHAR
0415  208D  B1 00             LDA (PNTL),Y    ;SUBROUTINE
0420  208F  C9 EE             CMP #$EE        ;TIME TO CARRIAGE RETURN?
0425  2091  D0 08             BNE LP10
0430  2093  A9 0D             LDA #$0D        ;OUTPUT C/R
0435  2095  20 06 20          JSR OUTV
0440  2098  4C BF 20          JMP STOP
0445  209B  85 04      LP10   STA TEMP        ;GET DATA
0450  209D  29 80             AND #$80        ;MARK OR SPACE
0455  209F  D0 0D             BNE MARK
0460  20A1  A4 04             LDY TEMP        ;MUST BE SPACE
0465  20A3  A9 20      LP11   LDA #$20        ;OUTPUT SPACE
0470  20A5  20 06 20          JSR OUTV
0475  20A8  88                DEY
0480  20A9  F0 14             BEQ STOP        ;ANY MORE?
0485  20AB  4C A3 20          JMP LP11        ;MUST BE
0490  20AE  A5 04      MARK   LDA TEMP        ;MUST BE MARK
0495  20B0  29 7F             AND #$7F        ;MASK BIT 7
0500  20B2  A8                TAY
0505  20B3  AD 0B 20   LP12   LDA PRCH GET PRINT CHAR
0510  20B6  20 06 20          JSR OUTV        ;OUTPUT MARK
0515  20B9  88                DEY
0520  20BA  F0 03             BEQ STOP        ;ANY MORE?
0525  20BC  4C B3 20          JMP LP12        ;MUST BE
0530  20BF  CA         STOP   DEX             ;CHECK END
0535  20C0  F0 06             BEQ LP13
0540  20C2  20 1E 21          JSR INCP        ;INC POINTER
0545  20C5  4C BB 20          JMP PNTC        ;GO BACK
0550  20CB  60         LP13   RTS
0555  20C9
0560  20C9  20 05 21   FDCH   JSR INTP        ;FIND CHARACTER
0565  20CC  A0 00      LOP1   LDY #0          ;SUBROUITNE
0570  20CE  B1 00             LDA (PNTL),Y    ;PICK UP ILLEGAL?
0575  20D0  C9 FF             CMP #$FF
0580  20D2  F0 1B             BEQ OUT
0585  20D4  C5 04             CMP TEMP        ;RIGHT ONE?
0590  20D6  F0 18             BEQ OUT1
0595  20D8  C8                INY             ;MUST NOT BE
0600  20D9  B1 00             LDA (PNTL),Y    ;BYTE COUNT
0605  20DB  18                CLC
0610  20DC  65 00             ADC PNTL        ;ADD TO POINTER
0615  20DE  85 00             STA PNTL
0620  20E0  A9 00             LDA #0
0625  20E2  65 01             ADC PNTH
0630  20E4  85 01             STA PNTH
0635  20E6  20 1E 21          JSR INCP
0640  20E9  20 1E 21          JSR INCP
0645  20EC  4C CC 20          JMP LOP1        ;LOOK AGAIN
0650  20EF  60         OUT    RTS
```

```
0655  20F0  20 1E 21     OUT1   JSR INCP          ;LOOK AT DATA
0660  20F3  B1 00               LDA (PNTL),Y
0665  20F5  AA                   TAX               ;BYTE IN X
0670  20F6  20 1E 21             JSR INCP
0675  20F9  60                   RTS
0680  20FA
0685  20FA  AD 0C 20     INTB   LDA BUFL          ;INITIALIZE
0690  20FD  85 02               STA BUF1          ;BUFFER SUB
0695  20FF  AD 0D 20             LDA BUFH
0700  2102  85 03               STA BUF2
0705  2104  60                   RTS
0710  2105
0715  2105  AD 09 20     INTP   LDA TBLL          ;INITIALIZE
0720  2108  85 00               STA PNTL          ;POINTER SUB
0725  210A  AD 0A 20             LDA TBLH
0730  210D  85 01               STA PNTH
0735  210F  60                   RTS
0740  2110
0745  2110  18           INCB   CLC               ;INCREMENT
0750  2111  A5 02               LDA BUF1          ;BUFFER SUB
0755  2113  69 01               ADC #$1
0760  2115  85 02               STA BUF1
0765  2117  A5 03               LDA BUF2
0770  2119  69 00               ADC #0
0775  211B  85 03               STA BUF2
0780  211D  60                   RTS
0785  211E
0790  211E  18           INCP   CLC               ;INCREMENT
0795  211F  A5 00               LDA PNTL
0800  2121  69 01               ADC #1            ;POINTER SUB
0805  2123  85 00               STA PNTL
0810  2125  A5 01               LDA PNTH
0815  2127  69 00               ADC #0
0820  2129  85 01               STA PNTH
0825  212B  60                   RTS
0830  212C
0835  212C  84 06        INPT   STY TEMPY         ;SAVE Y
0840  212E  20 5A 1E             JSR GETCH         ;GET A CHAR
0845  2131  A4 06               LDY TEMPY
0850  2133  60                   RTS
0855  2134
0860  2134  48           OUTC   PHA               ;SAVE CHAR
0865  2135  86 05               STX TEMPX         ;AND X AND Y
0870  2137  84 06               STY TEMPY
0875  2139  C9 0D               CMP #$0D          ;IS IT A C/R?
0880  213B  D0 06               BNE CONT
0885  213D  20 2F 1E             JSR CRLF
0890  2140  4C 46 21             JMP RESTOR        ;GET BACK THE REGS AND RETURN
0895  2143  20 A0 1E     CONT   JSR OUTCH         ;OTHERWISE USE KIM OUTPUT.
0900  2146  A6 05        RESTOR LDX TEMPX
0905  2148  A4 06               LDY TEMPY
0910  214A  68                   PLA               ;RETORE THE ACC.
0915  214B  60                   RTS               ;AND RETURN
0920  214C               FINISH .END
```

```
2200  20 07 EE EE EE EE EE EE EE 41 20 A3 EE A3 EE A3
2210  EE 0F 85 0A 85 EE 0F 85 0A 85 EE 0F 85 0A 85 EE
2220  0F 85 0A 85 EE A3 EE A3 EE A3 EE 42 2B A3 EE A3
2230  EE A3 EE 85 0A 85 0A 85 EE 85 0A 85 0A 85 EE 85
2240  0A 85 0A 85 EE 85 0A 85 0A 85 EE 01 A1 EE 03 8D
2250  03 8D EE 04 8B 05 8B EE 43 22 A3 EE A3 EE A3 EE
2260  85 19 85 EE 85 19 85 EE 85 19 85 EE 85 19 85 EE
2270  88 13 88 EE 88 13 88 EE 88 13 88 EE 44 1F A3 EE
2280  A3 EE A3 EE 85 19 85 EE 85 19 85 EE 85 19 85 EE
2290  85 19 85 EE 02 9F EE 03 9D EE 04 9B EE 45 2C A3
22A0  EE A3 EE A3 EE 85 0A 85 0A 85 EE 85 0A 85 0A 85
22B0  EE 85 0A 85 0A 85 EE 85 0A 85 0A 85 EE 85 0A 85
22C0  0A 85 EE 85 19 85 EE 85 19 85 EE 46 25 A3 EE A3
22D0  EE A3 EE 0F 85 0A 85 EE 0F 85 0A 85 EE 0F 85 0A
22E0  85 EE 0F 85 0A 85 EE 0F 85 0A 85 EE 1E 85 EE 1E
22F0  85 EE 47 26 A3 EE A3 EE A3 EE 85 19 85 EE 85 19

2300  85 EE 85 08 84 0D 85 EE 85 08 84 0D 85 EE 91 0A
2310  88 EE 91 0A 88 EE 91 0A 88 EE 48 18 A3 EE A3 EE
2320  A3 EE 0F 85 EE 0F 85 EE 0F 85 EE 0F 85 EE A3 EE
2330  A3 EE A3 EE 49 1F EE 85 19 85 EE 85 19 85 EE 85
2340  19 85 EE A3 EE A3 EE A3 EE 85 19 85 EE 85 19 85
2350  EE 85 19 85 EE 4A 1A 04 87 EE 03 88 EE 02 89 EE
2360  84 EE 84 EE 84 EE 84 EE 02 A1 EE 03 A0 EE 04 9F
2370  EE 4B 2A A3 EE A3 EE 0F 85 EE 0D 84 01 84 EE 0B
2380  84 05 84 EE 09 84 09 84 EE 07 84 0D 84 EE 05 84
2390  11 84 EE 03 84 15 84 EE 01 84 19 84 EE 4C 14 A3
23A0  EE A3 EE A3 EE 85 EE 85 EE 85 EE 85 EE 85 EE 85
23B0  EE 85 EE 4D 18 A3 EE A3 EE 17 8C EE 0C 8E EE 8F
23C0  EE 8F EE 0C 8E EE 17 8C EE A3 EE A3 EE 4E 19 A3
23D0  EE A3 EE 1A 89 EE 13 8A EE 0D 89 EE 0D 89 EE 06
23E0  89 EE 89 EE A3 EE A3 EE 4F 20 A3 EE A3 EE 84 1B
23F0  84 EE 84 1B 84 EE 84 1B 84 EE 84 1B 84 EE 84 1B

2400  84 EE 84 1B 84 EE A3 EE A3 EE 50 23 A3 EE A3 EE
2410  A3 EE 11 85 08 85 EE 11 85 08 85 EE 11 85 08 85
2420  EE 11 85 08 85 EE 11 92 EE 11 92 EE 11 92 EE 51
2430  20 A3 EE A3 EE 84 1B 84 EE 84 1B 84 EE 84 1B 84
2440  EE 84 02 84 15 84 EE A3 EE A3 EE 04 84 EE 02 84
2450  EE 52 21 A3 EE A3 EE A3 EE 11 85 08 85 EE 11 85
2460  08 85 EE 11 85 08 85 EE 96 08 85 EE A3 EE 11 92
2470  EE 11 92 EE 53 36 04 81 0F 8B EE 03 82 0E 8D EE
2480  01 84 0D 90 EE 85 0B 85 09 85 EE 85 0B 85 09 85
2490  EE 85 0B 85 09 85 EE 85 0B 85 09 85 EE 01 93 0A
24A0  84 EE 03 8F 0C 82 EE 04 8D 0D 81 EE 54 19 EE 1E
24B0  85 EE 1E 85 EE 1E 85 EE A3 EE A3 EE A3 EE 1E 85
24C0  EE 1E 85 EE 1E 85 EE 55 14 A3 EE A3 EE A3 EE 85
24D0  EE 85 EE 85 EE 85 EE A3 EE A3 EE A3 EE 56 1C 18
24E0  8B EE 11 8A EE 0B 89 EE 05 89 EE 88 EE 88 EE 05
24F0  89 EE 0B 89 EE 11 8A EE 18 8B EE 57 18 A3 EE A3

2500  EE 8A EE 07 8D EE 11 92 EE 11 92 EE 07 8D EE 8A
2510  EE A3 EE A3 EE 58 2C 88 15 86 EE 05 86 0F 86 EE
2520  08 86 09 86 EE 0B 86 03 86 EE 0E 89 EE 0E 89 EE
2530  0B 86 03 86 EE 08 86 09 86 EE 05 86 0F 86 EE 88
2540  15 86 EE 59 1C 1A 89 EE 17 88 EE 14 86 EE 12 85
2550  EE 94 EE 94 EE 12 85 EE 14 86 EE 17 88 EE 1A 89
2560  EE 5A 34 86 18 85 EE 89 15 85 EE 85 01 86 12 85
2570  EE 85 04 86 0F 85 EE 85 07 86 0C 85 EE 85 0A 86
2580  09 85 EE 85 0D 86 06 85 EE 85 10 86 03 85 EE 85
2590  13 8B EE 85 16 88 EE 30 1C A3 EE A3 EE A3 EE 85
25A0  19 85 EE 85 19 85 EE 85 19 85 EE 85 19 85 EE A3
25B0  EE A3 EE A3 EE 31 0D EE EE EE A3 EE A3 EE A3 EE
25C0  EE EE EE EE 32 30 94 0A 85 EE 94 0A 85 EE 94 0A
25D0  85 EE 85 0A 85 0A 85 EE 85 0A 85 0A 85 EE 85 0A
25E0  85 0A 85 EE 85 0A 85 0A 85 EE 85 0A 94 EE 85 0A
25F0  94 EE 85 0A 94 EE 33 30 85 0A 85 0A 85 EE 85 0A
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3400  85 0A 85 EE 85 0A 85 0A 85 EE 85 0A 85 0A 85 EE
3410  85 0A 85 0A 85 EE 85 0A 85 0A 85 EE 85 0A 85 0A
3420  85 EE A3 EE A3 EE A3 EE 34 1B 10 93 EE 10 93 EE
3430  10 93 EE 10 85 EE 10 85 EE 10 85 EE A3 EE A3 EE
3440  A3 EE 10 85 EE 35 30 85 0A 94 EE 85 0A 94 EE 85
3450  0A 94 EE 85 0A 85 0A 85 EE 85 0A 85 0A 85 EE 85
3460  0A 85 0A 85 EE 85 0A 85 0A 85 EE 94 0A 85 EE 94
3470  0A 85 EE 94 0A 85 EE 36 2A A3 EE A3 EE A3 EE 85
3480  08 85 0C 85 EE 85 08 85 0C 85 EE 85 08 85 0C 85
3490  EE 85 08 85 0C 85 EE 92 0C 85 EE 92 0C 85 EE 92
34A0  0C 85 EE 37 1B 1B 88 EE 1B 88 EE 1B 88 EE 1E 85
34B0  EE 1E 85 EE 1E 85 EE 1E 85 EE A3 EE A3 EE A3 EE
34C0  38 24 A3 EE A3 EE A3 EE 85 0A 85 0A 85 EE 85 0A
34D0  85 0A 85 EE 85 0A 85 0A 85 EE 85 0A 85 0A 85 EE
34E0  A3 EE A3 EE A3 EE 39 23 11 92 EE 11 92 EE 11 92
34F0  EE 11 85 08 85 EE 11 85 08 85 EE 11 85 08 85 EE

3500  11 85 08 85 EE A3 EE A3 EE A3 EE 0D 07 EE EE EE
3510  EE EE EE EE 2A 34 EE 09 82 06 82 06 82 EE 0B 82
3520  04 82 04 82 EE 0D 82 02 82 02 82 EE 0F 86 EE 09
3530  92 EE 0F 86 EE 0D 82 02 82 02 82 EE 0B 82 04 82
3540  04 82 EE 09 82 06 82 06 82 EE 2E 0D EE EE EE EE
3550  85 EE 85 EE 85 EE EE EE EE 2D 1E 0F 85 EE 0F 85
3560  EE 0F 85 EE 0F 85 EE 0F 85 EE 0F 85 EE 0F 85 EE
3570  0F 85 EE 0F 85 EE 0F 85 EE 2B 1C EE 0F 85 EE 0F

3580  85 EE 0F 85 EE 05 99 EE 05 99 EE 05 99 EE 0F 85
3590  EE 0F 85 EE 0F 85 EE 3A 16 EE EE EE EE 05 85 0D
35A0  85 EE 05 85 0D 85 EE 05 85 0D 85 EE EE EE EE 21
35B0  13 EE EE EE EE 85 03 9B EE 85 03 9B EE 85 03 9B
35C0  EE EE EE EE 3B 16 EE EE EE EE 05 85 0E 85 EE 04
35D0  86 0E 85 EE 02 88 0E 85 EE EE EE EE 3F 27 17 8C
35E0  EE 17 8C EE 17 8C EE 1E 85 EE 85 02 8B 0C 85 EE
35F0  85 02 8B 0C 85 EE 85 02 8B 0C 85 EE 0D 96 EE 0D

3600  96 EE 0D 96 EE 24 30 02 85 08 92 EE 02 85 08 92
3610  EE 02 85 08 92 EE 02 85 08 85 08 85 EE A3 EE A3
3620  EE 02 85 08 85 08 85 EE 02 92 08 85 EE 02 92 08
3630  85 EE 02 92 08 85 EE 2C 0F EE EE EE EE 03 85 EE
3640  02 86 EE 88 EE EE EE EE 28 16 EE EE EE EE A3 EE
3650  A3 EE A3 EE 85 19 85 EE 85 19 85 EE 85 19 85 EE
3660  29 16 85 19 85 EE 85 19 85 EE 85 19 85 EE A3 EE
3670  A3 EE A3 EE EE EE EE EE FF CD 00 40 5E 40 C0 30
3680  4E 1A 40 40 CF 75 C4 82 4F 6F 46 00 56 76 06 00
3690  96 75 52 40 DF C6 76 A0 6E 77 04 42 5F FF C6 80
36A0  15 3E 40 44 57 F4 07 37 F6 4F 40 04 6B EE E7 02
36B0  F7 E2 40 30 86 37 C3 05 C7 76 62 01 96 9F E6 62
36C0  47 5D 44 01 76 23 04 61 47 D3 02 01 B2 3E 00 00
36D0  97 F6 12 A0 F7 D7 40 00 97 6C 82 40 E7 F6 00 88
36E0  B7 64 44 21 BA 0E 02 01 0F FD 00 01 A9 C1 00 00
36F0  FF FE 06 C0 76 F5 C6 D0 FF D6 00 40 A7 FC 42 60
```

EDITORS NOTE: The disassembler program was originally written for the Apple and appeared in Doctor Dobbs Journal (Sept 76). It has been modified for KIM by Bob Kurtz and your editor. Bob Kurtz wrote the article.

KIM-1 "DISASSEMBLER" PROGRAM

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PRELIMINARY:

The purpose of the disassembler is to take any program that has been entered into memory in the KIM-1, and to print-out an "object" code and a "source" code listing of this program - to permit analysis and modification, if desired. In a sense, it takes a completed program and reconstructs the assembly language format - or "disassembles" the program.

The following is a sample of the print-out format:

```
Address   Object Code     Source Code

 23BC-    E8              INY
 23BD-    A9 53           LDA   #53
 23BF-    85 01           STA   01
 23C1     91 7E           STA   (7E),Y
 23C3-    4C 64 1C        JMP   1C64
```

```
                ;DISASSEMBLER PROGRAM FOR THE 6502
0020  2000       ;WRITTEN BY STEVE WOZNIAK & ALLEN BAUM
0030  2000       ;AND PUBLISHED IN DOCTOR DOBBS JOURNAL
0040  2000       ;SEPT 1976
0050  2000       ;
0060  2000
0070  2000                       *=$0
0072  0000             PCL       *=*+1
0073  0001             PCH       *=*+1
0075  0002             COUNT     *=*+1
0080  0003             FORMAT    *=*+1
0090  0004             LENGTH    *=*+1
0100  0005             LMNEM     *=*+1
0110  0006             RMNEM     *=*+1
0142  0007             YSAVE     *=*+1
0150  0008             ;
0160  0008             ;KIM I/O TO FOLLOW
0170  0008             PRTBYT    =$1E3B
0180  0008             OUTCH     =$1EA0
0190  0008             CRLF      =$1E2F
0191  0008             CLEAR     =$1C64
0192  0008             OUTSP     =$1E9E
0200  0008             ;
0210  0008                       *=$2000
0211  2000  20 0F 20   START     JSR DSMBL
0212  2003  20 9E 1E             JSR OUTSP
0213  2006  20 9E 1E             JSR OUTSP
0214  2009  20 9E 1E             JSR OUTSP
0215  200C  4C 64 1C             JMP CLEAR
0220  200F  A9 0D       DSMBL     LDA #13         ;COUNT FOR 13 INSTR. DSMBLY.
0230  2011  85 02                STA COUNT
```

The Address and Object Code columns are the standard listings for the program under scrutiny. You will notice that the disassembler has arranged the code listing by one, two, or three byte commands and has printed the address column accordingly.

The Source Code columns contain the MOS Technology 650X Mnemonic abbreviations for the command - and the Operand listing. The following is an explanation of the address mode for the various operands:

Operand	Address Mode
blank	Accumulator, Implied
#53	Immediate
01	Zero Page
01,X 01,Y	Zero Page, indexed by X or Y
(7E),Y	Indirect Indexed
(7E,X)	Indexed Indirect
1C64	Absolute of Branch
(1C64)	Indirect
1C64,X	Absolute (indexed by X)
1C64,Y	Absolute (indexed by Y)

PROCEDURE:

1. Load the starting address of the program to be disassembled into locations 0000 (Low byte) and 0001 (High byte).

2. Go to location 2000

3. Press "G" on terminal

The "disassembler" will now print-out the first 13 commands of the program under scrutiny. At the end of this print-out, simply press "G" again and the next 13 commands will be printed out. Continuing to press "G" whenever the program stops, will step you through the entire program under investigation.

The program stops after each 13 commands. If you wish to modify this, change the byte in location 2010 from $0D (13 decimal) to any number up to $FF (256 decimal).

If portions of the disassembled program do not appear to make sense, these may be "look-up" tables within the program. As an example, the disassembler can be used to "disassemble" the disassembler program! Addresses $2000 to $211A will print out properly since these contain the body of the program commands. However, locations $211B to $21F9 contain the tables for all the mnemonics and symbols and will print-out gibberish.

```
0240  2013  20 21 20    DSMBL2 JSR INSTDS      ;DISASSEMBLE AND DISPLAY INSTR.
0250  2016  20 FC 20           JSR PCADJ
0260  2019  85 00              STA PCL          ;UPDATE PCL,H TO NEXT INSTR.
0270  201B  84 01              STY PCH
0280  201D  C6 02              DEC COUNT        ;DONE FIRST 19 INSTR?
0290  201F  D0 F2              BNE DSMBL2       ;YES, LOOP. ELSE DSMBL 20TH.
0300  2021  20 E2 20    INSTDS JSR PRPC         ;PRINT PCL,H
0310  2024  A1 00              LDA (PCL,X)      ;GET OPCODE
0320  2026  A8                 TAY
0330  2027  4A                 LSR A            ;EVEN/ODD TEST
0340  2028  90 0B              BCC IEVEN
0350  202A  4A                 LSR A            ;TEST BIT 1.
0360  202B  B0 17              BCS ERR          ;XXXXXX11 INSTR. INVALID.
0370  202D  C9 22              CMP #$22
0380  202F  F0 13              BEQ ERR          ;10001001 INSTR. INVALID.
0390  2031  29 07              AND #$7          ;MASK 3 BITS FOR ADDRESS MODE &
0400  2033  09 80              ORA #$80         ;ADD INDEXING OFFSET.
0410  2035  4A           IEVEN  LSR A            ;LSB INTO CARRY FOR
0420  2036  AA                 TAX              ;LEFT/RIGHT TEST BELOW.
0430  2037  BD 1B 21           LDA MODE,X       ;INDEX INTO ADDRESS MODE TABLE.
0440  203A  B0 04              BCS RTMODE       ;IF CARRY SET USE LSD FOR
0450  203C  4A                 LSR A            ;PRINT FORMAT INDEX
0460  203D  4A                 LSR A
0470  203E  4A                 LSR A            ;IF CARRY CLEAR USE MSD.
0480  203F  4A                 LSR A
0490  2040  29 0F       RTMODE AND #$F          ;MASK FOR 4-BIT INDEX.
0500  2042  D0 04              BNE GETFMT       ;$0 FOR INVALID OP CODES.
0510  2044  A0 80        ERR   LDY #$80         ;SUBSTITUTE $80 FOR INVALID OP,
0520  2046  A9 00              LDA #$0          ;SET PRINT FORMAT INDEX TO 0
0530  2048  AA           GETFMT TAX
0540  2049  BD 5F 21           LDA MODE2,X      ;INDEX INTO PRINT FORMAT TABLE.
0550  204C  85 03              STA FORMAT       ;SAVE FOR ADDRESS FIELD FORMAT.
0560  204E  29 03              AND #$3          ;MASK 2-BIT LENGTH. 0=1-BYTE
0570  2050  85 04              STA LENGTH       ;1=2-BYTE, 2=3-BYTE.
0580  2052  98                 TYA              ;OP CODE.
0590  2053  29 8F              AND #$8F         ;MASK IT FOR 1XXX1010 TEST.
0600  2055  AA                 TAX              ;SAVE IT.
0610  2056  98                 TYA              ;OP CODE TO 'A' AGAIN.
0620  2057  A0 03              LDY #$3
0630  2059  E0 8A              CPX #$8A
0640  205B  F0 0B              BEQ MNNDX3
0650  205D  4A           MNNDX1 LSR A
0660  205E  90 08              BCC MNNDX3       ;FORM INDEX INTO MNEMONIC TABLE.
0670  2060  4A                 LSR A
0680  2061  4A           MNNDX2 LSR A            ;1XXX1010 -> 00101XXX
0690  2062  09 20              ORA #$20         ;XXXYYY01 -> 00111XXX
0700  2064  88                 DEY              ;XXXYYY10 -> 00110XXX
0710  2065  D0 FA              BNE MNNDX2       ;XXXYY100 -> 00100XXX
0720  2067  C8                 INY              ;XXXXX000 -> 000XXXXX
0730  2068  88           MNNDX3 DEY
0740  2069  D0 F2              BNE MNNDX1
0750  206B  48                 PHA              ;SAVE MNEMONIC TABLE INDEX.
0760  206C  B1 00        PROP  LDA (PCL),Y
0770  206E  20 13 21           JSR PRBYT
0780  2071  A2 01              LDX #$1
0790  2073  20 F3 20    PROPBL JSR PRBL2
0800  2076  C4 04              CPY LENGTH       ;PRINT INSTR (1 TO 3 BYTES)
0810  2078  C8                 INY              ;IN A 12 CHARACTYER FIELD.
0820  2079  90 F1              BCC PROP
0830  207B  A2 03              LDX #$3          ;CHAR COUNT FOR MNEMONIC PRINT.
0840  207D  C0 04              CPY #$4
0850  207F  90 F2              BCC PROPBL
0860  2081  68                 PLA              ;RECOVER MNEMONIC INDEX.
0870  2082  A8                 TAY
0880  2083  B9 79 21           LDA MNEML,Y
0890  2086  85 05              STA LMNEM        ;FETCH 3-CHAR MNEMONIC
0900  2088  B9 B9 21           LDA MNEMR,Y      ;(PACKED IN TWO BYTES)
0910  208B  85 06              STA RMNEM
0920  208D  A9 00        PRMN1 LDA #$0
0930  208F  A0 05              LDY #$5
0940  2091  06 06        PRMN2 ASL RMNEM
0950  2093  26 05              ROL LMNEM        ;SHIFT 5 BITS OF CHAR INTO 'A'.
0960  2095  2A                 ROL A            ;(CLEAR CARRY)
0970  2096  88                 DEY
0980  2097  D0 F8              BNE PRMN2
0990  2099  69 3F              ADC #$3F         ;ADD '?' OFFSET.
1000  209B  20 0B 21           JSR OUTC         ;OUTPUT A CHAR OR MNEMONIC
1010  209E  CA                 DEX
1020  209F  D0 EC              BNE PRMN1
1030  20A1  20 F1 20           JSR PRBLNK       ;OUTPUT 3 BLANKS.
1040  20A4  A2 06              LDX #$6          ;COUNT FOR 6 PRINT FORMAT BITS.
1050  20A6  E0 03        PRADR1 CPX #$3
1060  20A8  D0 12              BNE PRADR3       ;IF X=3 THEN PRINT ADDRESS VAL.
1070  20AA  A4 04              LDY LENGTH
1080  20AC  F0 0E              BEQ PRADR3       ;NO PRINT IF LENGTH=0.
1090  20AE  A5 03        PRADR2 LDA FORMAT
1100  20B0  C9 E8              CMP #$E8         ;HANDLE REL ADDRESSING MODE
1110  20B2  B1 00              LDA (PCL),Y      ;SPECIAL (PRINT TARGET ADDR)
1120  20B4  B0 1C              BCS RELADR       ;(NOT DISPLACEMENT)
1130  20B6  20 13 21           JSR PRBYT        ;OUTPUT 1- OR 2- BYTE ADDRESS.
1140  20B9  88                 DEY              ;MORE SIGNIFICANT BYTE FIRST.
1150  20BA  D0 F2              BNE PRADR2
```

```
1160  20BC  06 03     PRADR3 ASL FORMAT      #TEST NEXT PRINT FORMAT BIT.
1170  20BE  90 0E            BCC PRADR4      #IF 0, DONT PRINT
1180  20C0  BD 6C 21         LDA CHAR1-1,X   #CORRESPONDING CHAR.
1190  20C3  20 0B 21         JSR OUTC        #OUTPUT 1 OR 2 CHARS.
1200  20C6  BD 72 21         LDA CHAR2-1,X   #(IF CHAR FROM CHAR2 IS 0,
1210  20C9  F0 03            BEQ PRADR4      #DON'T PRINT IT)
1220  20CB  20 0B 21         JSR OUTC
1230  20CE  CA        PRADR4 DEX
1240  20CF  D0 D5            BNE PRADR1
1250  20D1  60               RTS             #RETURN IF DONE 6 FORMAT BITS.
1260  20D2  20 FF 20  RELADR JSR PCADJ3       #PCL,H + DISPL + 1 TO 'A','Y'.
1270  20D5  AA               TAX
1280  20D6  E8               INX
1290  20D7  D0 01            BNE PRNTYX      #  +1 TO 'X','Y'.
1300  20D9  C8               INY
1310  20DA  98        PRNTYX TYA
1320  20DB  20 13 21  PRNTAX JSR PRBYT       #PRINT TARGET ADDRESS OF BRANCH
1330  20DE  8A        PRNTX  TXA             #AND RETURN
1340  20DF  4C 13 21         JMP PRBYT
1350  20E2  20 2F 1E  PRPC   JSR CRLF        #OUTPUT CARRIAGE RETURN.
1360  20E5  A5 01            LDA PCH
1370  20E7  A6 00            LDX PCL
1380  20E9  20 DB 20         JSR PRNTAX      #OUTPUT PCL,H
1390  20EC  A9 2D            LDA #'-
1400  20EE  20 0B 21         JSR OUTC        #OUTPUT '-'
1410  20F1  A2 03     PRBLNK LDX #$3         #BLANK COUNT
1420  20F3  A9 20     PRBL2  LDA #' 
1430  20F5  20 0B 21  PRBL3  JSR OUTC        #OUTPUT A BLANK
1440  20F8  CA               DEX
1450  20F9  D0 F8            BNE PRBL2       #LOOP UNTIL COUNT =0
1460  20FB  60               RTS
1470  20FC  A5 04     PCADJ  LDA LENGTH      #0=1-BYTE, 1=2-BYTE, 2=3-BYTE.
1480  20FE  38        PCADJ2 SEC
1490  20FF  A4 01     PCADJ3 LDY PCH
1500  2101  AA               TAX             #TEST DISPL SIGN (FOR REL
1510  2102  10 01            BPL PCADJ4      #BRANCH). EXTEND NEG
1520  2104  88               DEY             #BY DECREMENTING PCH.
1530  2105  65 00     PCADJ4 ADC PCL
1540  2107  90 01            BCC RTS1        #PCL+LENGTH (OR DISPL) +1 TO 'A'.
1550  2109  C8               INY             #CARRY INTO 'Y' (PCH)
1560  210A  60        RTS1   RTS
1561  210B  84 07     OUTC   STY YSAVE
1562  210D  20 A0 1E         JSR OUTCH
1563  2110  A4 07            LDY YSAVE
1564  2112  60               RTS
1565  2113  84 07     PRBYT  STY YSAVE
1566  2115  20 3B 1E         JSR PRTBYT
1567  2118  A4 07            LDY YSAVE
1568  211A  60               RTS
1570  211B                   ;
1580  211B                   ;
1590  211B                   #THE TABLES FOLLOW---
1600  211B                   ;
1610  211B  40        MODE   .BYTE $40,$2,$45,$3,$D0,$8,$40,$9,$30
1610  211C  02
1610  211D  45
1610  211E  03
1610  211F  D0
1610  2120  08
1610  2121  40
1610  2122  09
1610  2123  30
1620  2124                   #XXXXXX20 INSTRUCTIONS.
1630  2124  22               .BYTE $22,$45,$33,$D0,$8,$40,$9,$40,$2,$45
1630  2125  45
1630  2126  33
1630  2127  D0
1630  2128  08
1630  2129  40
1630  212A  09
1630  212B  40
1630  212C  02
1630  212D  45
1640  212E                   ;Z=0, LEFT HALF BYTE
1650  212E                   ;Z=1, RIGHT HALF BYTE
1660  212E  33               .BYTE $33,$D0,$8,$40,$9,$40,$2,$45,$B3,$D0
1660  212F  D0
1660  2130  08
1660  2131  40
1660  2132  09
1660  2133  40
1660  2134  02
1660  2135  45
1660  2136  B3
1660  2137  D0
1670  2138  08               .BYTE $8,$40,$9,$0,$22,$44,$33,$D0,$8C,$44
1670  2139  40
1670  213A  09
1670  213B  00
1670  213C  22
1670  213D  44
1670  213E  33
1670  213F  D0
1670  2140  8C
1670  2141  44
```

```
1680  2142  00              .BYTE $0,$11,$22,$44,$33,$D0,$8C,$44,$9A,$10
1680  2143  11
1680  2144  22
1680  2145  44
1680  2146  33
1680  2147  D0
1680  2148  8C
1680  2149  44
1680  214A  9A
1680  214B  10
1690  214C  22              .BYTE $22,$44,$33,$D0,$8,$40,$9,$10,$22,$44
1690  214D  44
1690  214E  33
1690  214F  D0
1690  2150  08
1690  2151  40
1690  2152  09
1690  2153  10
1690  2154  22
1690  2155  44
1700  2156  33              .BYTE $33,$D0,$8,$40,$9,$62
1700  2157  D0
1700  2158  08
1700  2159  40
1700  215A  09
1700  215B  62
1710  215C                  ;YYXXXZ01 INSTRUCTIONS
1720  215C  13              .BYTE $13,$78,$A9
1720  215D  78
1720  215E  A9
1730  215F  00        MODE2 .BYTE $0          ;ERR
1740  2160  21              .BYTE $21         ;IMM
1750  2161  01              .BYTE $01         ;Z-PAG
1760  2162  02              .BYTE $02         ;ABS
1770  2163  00              .BYTE $0          ;IMPL
1780  2164  80              .BYTE $80         ;ACC
1790  2165  59              .BYTE $59         ;(Z-PAG,X)
1800  2166  4D              .BYTE $4D         ;(Z-PAG),Y
1810  2167  11              .BYTE $11         ;Z-PAG,X
1820  2168  12              .BYTE $12         ;ABS,X
1830  2169  06              .BYTE $6          ;ABS,Y
1840  216A  4A              .BYTE $4A         ;(ABS)
1850  216B  05              .BYTE $5          ;Z-PAG,Y
1860  216C  1D              .BYTE $1D         ;REL
1870  216D  2C        CHAR1 .BYTE $2C,$29,$2C,$23,$28,$41
1870  216E  29
1870  216F  2C
1870  2170  23
1870  2171  28
1870  2172  41
1890  2173  59        CHAR2 .BYTE $59,$0,$58,$00,$0,$0
1890  2174  00
1890  2175  58
1890  2176  00
1890  2177  00
1890  2178  00
1900  2179                  ;XXXXX000 INSTRUCTIONS
1910  2179  1C        MNEML .BYTE $1C,$8A,$1C,$23,$5D,$8B,$1B,$A1,$9D
1910  217A  8A
1910  217B  1C
1910  217C  23
1910  217D  5D
1910  217E  8B
1910  217F  1B
1910  2180  A1
1910  2181  9D
1920  2182  8A              .BYTE $8A,$1D,$23,$9D,$8B,$1D,$A1,$0,$29,$19
1920  2183  1D
1920  2184  23
1920  2185  9D
1920  2186  8B
1920  2187  1D
1920  2188  A1
1920  2189  00
1920  218A  29
1920  218B  19
1930  218C  AE              .BYTE $AE,$69,$A8,$19,$23,$24,$53,$1B,$23
1930  218D  69
1930  218E  A8
1930  218F  19
1930  2190  23
1930  2191  24
1930  2192  53
1930  2193  1B
1930  2194  23
1940  2195  24              .BYTE $24,$53,$19,$A1,$0
1940  2196  53
1940  2197  19
1940  2198  A1
1940  2199  00
```

```
1950  219A                    #XXXYY100 INSTRUCTIONS.
1960  219A  1A                       .BYTE $1A,$5B,$5B,$A5,$69,$24,$24
1960  219B  5B
1960  219C  5B
1960  219D  A5
1960  219E  69
1960  219F  24
1960  21A0  24
1962  21A1                    #1XXX1010 INSTRUCTIONS
1963  21A1  AE                       .BYTE $AE,$AE,$A8,$AD,$29,$0,$7C,$0
1963  21A2  AE
1963  21A3  A8
1963  21A4  AD
1963  21A5  29
1963  21A6  00
1963  21A7  7C
1963  21A8  00
1964  21A9                    #XXXYYY10 INSTRUCTIONS
1965  21A9  15                       .BYTE $15,$9C,$6D,$9C,$A5,$69,$29,$53
1965  21AA  9C
1965  21AB  6D
1965  21AC  9C
1965  21AD  A5
1965  21AE  69
1965  21AF  29
1965  21B0  53
1970  21B1                    #XXXYY01 INSTRUCTIONS.
1980  21B1  84                       .BYTE $84,$13,$34,$11,$A5,$69,$23,$A0
1980  21B2  13
1980  21B3  34
1980  21B4  11
1980  21B5  A5
1980  21B6  69
1980  21B7  23
1980  21B8  A0
1990  21B9                    #XXXXX000 INSTRUCTIONS.
2000  21B9  D8                 MNEMR  .BYTE $D8,$62,$5A,$48,$26,$62,$94,$88
2000  21BA  62
2000  21BB  5A
2000  21BC  48
2000  21BD  26
2000  21BE  62
2000  21BF  94
2000  21C0  88
2010  21C1  54                       .BYTE $54,$44,$C8,$54,$68,$44,$E8,$94,$0,$B4
2010  21C2  44
2010  21C3  C8
2010  21C4  54
2010  21C5  68
2010  21C6  44
2010  21C7  E8
2010  21C8  94
2010  21C9  00
2010  21CA  B4
2020  21CB  08                       .BYTE $8,$84,$74,$B4,$28,$6E,$74,$F4,$CC,$4A
2020  21CC  84
2020  21CD  74
2020  21CE  B4
2020  21CF  28
2020  21D0  6E
2020  21D1  74
2020  21D2  F4
2020  21D3  CC
2020  21D4  4A
2030  21D5  72                       .BYTE $72,$F2,$A4,$8A
2030  21D6  F2
2030  21D7  A4
2030  21D8  8A
2040  21D9                    #XXXYY100 INSTRUCTIONS.
2050  21D9  00                       .BYTE $0,$AA,$A2,$A2,$74,$74,$74,$72
2050  21DA  AA
2050  21DB  A2
2050  21DC  A2
2050  21DD  74
2050  21DE  74
2050  21DF  74
2050  21E0  72
2060  21E1                    #1XXX1010 INSTRUCTIONS.
2070  21E1  44                       .BYTE $44,$68,$B2,$32,$B2,$0,$22,$0
2070  21E2  68
2070  21E3  B2
2070  21E4  32
2070  21E5  B2
2070  21E6  00
2070  21E7  22
2070  21E8  00
2080  21E9                    #XXXYYYY10 INSTRUCTIONS.
2090  21E9  1A                       .BYTE $1A,$1A,$26,$26,$72,$72,$88,$C8
2090  21EA  1A
2090  21EB  26
2090  21EC  26
2090  21ED  72
2090  21EE  72
2090  21EF  88
2090  21F0  C8
```

```
2100  21F1                 ;XXXYYY01 INSTRUCTIONS
2110  21F1  C4                   .BYTE $C4,$CA,$26,$48,$44,$44,$A2,$C8
2110  21F2  CA
2110  21F3  26
2110  21F4  48
2110  21F5  44
2110  21F6  44
2110  21F7  A2
2110  21F8  C8
2120  21F9                 FINISH .END
```

CHECK-OUT

by Robert D. Larrabee
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Did you ever want to check-out a new program without having to continually hit the plus key of your KIM? Did you ever wish you could back-up a byte or two? Did you ever want to add some material in the middle of a program without having to reenter all of the succeeding bytes? If you ever did, program CHECK-OUT is for you!

Load this program into the stack page, push the PC key to enter the starting address (0100), and then push the GO key. The display will show address 0000 and the contents of that memory location. Then push the B key to start automatically scanning through memory toward the Back of the program, or the F key to start scanning toward the Front of the program. The keys 1 through 9 control the scan speed. The zero key stops the scan at the displayed address. The A key stops the scan one position beyond the currently displayed address, while the E key stops the scan one position previous to the currently displayed address. If the scan speed is set to 9 (the fastest possible), the A and E keys are equivalent to an immediate one step forward or backward. Because the plus key was there, it was given its normal function.

If, in scanning a program, an error is found, stop the scan at the error (by pushing the zero key at the error, or stepping there with the A, E, or plus keys). The push the DA key, and you will enter the KIM monitor in data mode. The corrected data can then be immediately entered from the keyboard, and you can then return to program CHECK-OUT by pushing the ST key.

If you wish to make a large jump in address, and scanning there at speed 9 would take too long, push the AD key to enter the KIM monitor in address mode. The new address of interest can then be immediately entered from the keyboard, and you can then return to program CHECK-OUT by pushing the ST key.

The C key Creates spaces for additional bytes in a program by moving the program material down from the displayed address one unit each time the C key is depressed. The byte displayed and all following bytes are moved down and the created space at the displayed address is filled with zeros. The D key Deletes the displayed byte by moving up all the following program material one unit each time the D key is depressed. Neither the C or D key effects the portion of the program before the displayed address. The table below shows what address program CHECK-OUT considers to be the end of the program. Notice that this depends on the page currently being displayed when the C or D key is depressed. If desired, these ending locations can be changed by entering appropriate new address information at the locations indicated in the last two columns of the table.

When attempting to do something program CHECK-OUT considers illegal (for example, modifying some of its own instructions on page 1), the display will go blank for as long as the illegal key is depressed, and then all will return to the previous conditions when the illegal key is released.

Program CHECK-OUT does nothing in the way of changing branch instruction addresses when creating or deleting spaces. If this feature is desired, I invite you to write a routine to perform this address manipulation. Change the branch instruction at location 01D1 in program CHECK-OUT to branch to your routine, and then return to address 0104 in program CHECK-OUT at the end of your routine.

Page of current address	Address taken as the end of the program	Location of these data within program CHECK-OUT	
		High	Low
0	00EE	-	0187
1	not allowed	-	-
2-16	03FF	0193	0195
17	17E6	-	0199
above 17	not allowed	-	-

STORAGE AREA

```
00EF 00          PCL       program counter, low
00F0 01          PCH       program counter, high
00F1 00          PREG      status register
00F2 FF          SPUSER    stack pointer
00F3 00          ADL       current address, low
00F4 00          ADH       current address, high
00F5 05          SS        scan speed (0-9)
00F6 00          RD        read disable (disable if not zero)
00F7 00          MODE      mode of operation (stop scan if zero)
00F8 FF          LC        loop counter for display loop
00F9 00          INH       data position for display
00FA FA          POINTL    pointer address, low
00FB 00          POINTH    pointer address, high
00FC 01          TEMP1     temporary storage register #1
00FD 00          TEMP2     temporary storage register #2
00FE 00                    not used
00FF 00                    not used
```

this program assumes the CPU is in the binary mode $00F1 = $00

MAIN PROGRAM STARTS HERE

```
0100 A9 00     ENTRY  LDA #00      initial entry into program
0102 85 FB            STA POINTH   set initial value of POINTL
0104 A5 FA     START  LDA POINTL   get pointer address, low
0106 85 F3            STA ADL      store pointer address, low in ADL
0108 A5 FB            LDA POINTH   get pointer address, high
010A 85 F4            STA ADH      store pointer address, high in ADH
010C A2 FF            LDX #FF      initial value of SPUSER and LC
010E 9A               TXS          initialize stack pointer to #FF
010F 86 F8            STX LC       initialize loop counter to #FF
0111 A2 04            LDX #04      value for interrupt vector, low
0113 8E FA 17         STX 17FA     initialize interrupt vector, low
0116 A2 01            LDX #01      value for interrupt vector, high
0118 8E FB 17         STX 17FB     initialize interrupt vector, high
```

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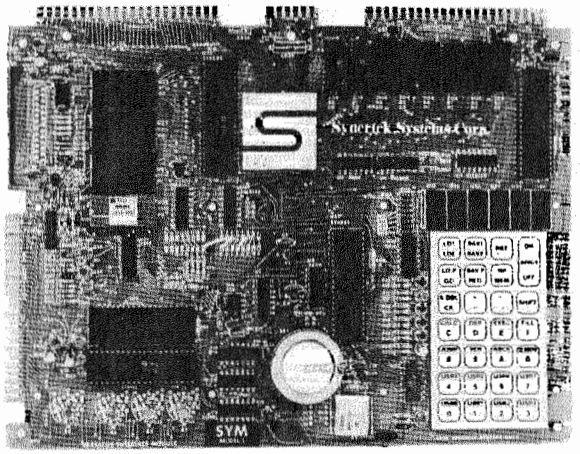

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DISPLAY/KEYBOARD-DECODE LOOP

```
011B A9 80     LOOP1   LDA #80         value to store in the timer
011D 8D 47 17          STA 1747        start timer
0120 20 19 1F  AGAIN   JSR SCAND       activate display
0123 D0 04             BNE ONE         branch if any key is depressed
0125 85 F6             STA RD          enable the reading of the keyboard
0127 F0 43             BEQ DONE        unconditional branch to end of loop
0129 A5 F6     ONE     LDA RD          get value of read disable
012B D0 3F             BNE DONE        branch to end of loop if RD not zero
012D E6 F6             INC RD          set read disable to #01
012F 20 6A 1F  ERROR   JSR GETKEY      read keyboard
0132 C9 00             CMP #00         is the zero key depressed?
0134 F0 32             BEQ MZERO       branch if the zero key is depressed
0136 AA                TAX             store keycode in X register
0137 38                SEC             required by next instruction
0138 E9 0A             SBC #0A         subtract #0A from keycode
013A 10 06             BPL TWO         branch if keycode is not speed control
013C 49 FF             EOR #FF         compute new value of speed
013E 85 F5             STA SS          store new value of speed in SS
0140 10 2A             BPL DONE        unconditional branch to end of loop

0142 8A        TWO     TXA             return keycode to accumulator
0143 C9 12             CMP #12         is the plus key depressed?
0145 F0 36             BEQ PLUS        branch if plus key depressed
0147 10 23             BPL DONE        ignore unused keys
0149 C9 10             CMP #10         is the AD key depressed?
014B D0 03             BNE THREE       branch if AD key not depressed
014D 4C 7C 1C  KIM     JMP 1C7C        enter the KIM monitor
0150 29 0A     THREE   AND #0A         result not #0A for C, D, & DA keys
0152 C9 0A             CMP #0A         result is #0A for A, B, E, & F keys
0154 F0 14             BEQ MODE        branch if key is A, B, E, or F
0156 A4 FB             LDY POINTH      load page number into Y register
0158 88                DEY             decrement page number in Y register
0159 F0 D4             BEQ ERROR       blank display if page number = 1
015B A5 F7             LDA MODE        load mode into Y register
015D F0 02             BEQ FOUR        branch if mode is zero
015F 10 CE             BPL ERROR       blank display if mode not zero
0161 8A        FOUR    TXA             return keycode to accumulator
0162 C9 11             CMP #11         is the DA key depressed?
0164 F0 E7             BEQ KIM         enter the KIM monitor if DA key
0166 D0 1C             BNE MOVE        branch if C or D key depressed
0168 A2 00     MZERO   LDX #00         the new value of mode
016A 86 F7     MODE    STX MODE        store the new value of mode
016C AD 47 17  DONE    LDA 1747        test the clock
016F F0 AF             BEQ AGAIN       display again if not time
0171 E6 F8             INC LC          add one to loop counter
0173 A5 F8             LDA LC          get new value of loop counter
0175 C5 F5             CMP SS          compare to total number desired
0177 90 A2             BCC LOOP1       do another loop if necessary
0179 A6 F7             LDX MODE        get value of mode
017B F0 04             BEQ FIVE        return to START if mode is zero
017D 8A                TXA             put mode in accumulator
017E 20 D6 01          JSR NEXT        set up next POINTL and POINTH
0181 4C 04 01  FIVE    JMP START       end of display/keyboard loop
```

ROUTINE TO SERVICE THE C AND D KEYS

```
0184 86 FC     MOVE    STX TEMP1       store keycode in TEMP1
0186 A0 EE             LDY #EE         location of useful end of page zero
0188 A5 F4             LDA ADH         put page number in accumulator
018A F0 0E             BEQ SEVEN       branch if page zero
018C C9 17             CMP #17         is page number equal to 17?
018E F0 08             BEQ SIX         branch if page number is 17
0190 B0 9D             BCS ERROR       blank display if page number > 17
0192 A9 03             LDA #03         end page in unexpanded KIM system RAM
0194 A0 FF             LDY #FF         location of end of page
0196 30 02             BMI SEVEN       unconditional jump
0198 A0 E6     SIX     LDY #E6         location of useful end of page 17
019A 84 FA     SEVEN   STY POINTL      store end of page location in POINTL
019C 85 FB             STA POINTH      store end page number in POINTH
019E A0 00             LDY #00         value needed for (indirect),Y addressing
01A0 B1 FA             LDA POINTL,Y    LDA with byte at the end of the last page
01A2 AA                TAX             store byte in the X register
01A3 98                TYA             bring #00 to accumulator
01A4 91 FA             STA POINTL,Y    put zero in end of page location
01A6 20 EE 01  LOOP2   JSR SUB         decrement POINTL/POINTH
01A9 A5 FC             LDA TEMP1       get keycode from TEMP1
01AB C9 0D             CMP #0D         which key (C or D) is depressed?
01AD F0 0B             BEQ DKEY        branch if D key is depressed
01AF B1 FA     CKEY    LDA POINTL,Y    get byte at pointed location
01B1 C8                INY             increment Y register to unity
01B2 91 FA             STA POINTL,Y    store byte in next larger address
01B4 88                DEY             decrement Y register to zero
01B5 98                TYA             set accumulator to zero
01B6 91 FA             STA POINTL,Y    store zero in pointed location
01B8 F0 09             BEQ TEST        branch around D key instructions
01BA B1 FA     DKEY    LDA POINTL,Y    get byte at pointed location
01BC 85 FD             STA TEMP2       store temporarily in TEMP2
01BE 8A                TXA             bring following byte to accumulator
01BF 91 FA             STA POINTL,Y    store byte in pointed location
01C1 A6 FD             LDX TEMP2       retrieve stored byte
01C3 A5 F4     TEST    LDA ADH         ADH is endpoint of POINTH
01C5 C5 FB             CMP POINTH      has final page been reached?
01C7 90 DD             BCC LOOP2       if not, loop back
01C9 D0 06             BNE END         all done if ADH > POINTH
```

```
01CB A5 F3          LDA ADL       ADL is endpoint of POINTL
01CD C5 FA          CMP POINTL    has final location been reached?
01CF 90 D5          BCC LOOP2     if not, loop back
01D1 4C 04 01 END   JMP START     end of C and D key routine
01D4 EA             NOP           not used
01D5 EA             NOP           not used

                SUBROUTINE TO STEP POINTL AND POINTH

01D6 A0 00    NEXT  LDY #00       possible new value of mode
01D8 29 01          AND #01       is least significant digit zero?
01DA D0 02          BNE EIGHT     F and B keys require nonzero mode
01DC 84 F7          STY MODE      A and E keys require zero mode
01DE 88       EIGHT DEY           decrement Y register to #FF
01DF 8A             TXA           bring mode to accumulator
01E0 29 04          AND #04       in which direction is the scan?
01E2 D0 0A          BNE SUB       branch if E or F key depressed
01E4 98       ADD   TYA           bring #FF to accumulator
01E5 C5 FA          CMP POINTL    is POINTL equal to #FF?
01E7 D0 02          BNE NINE      branch if not equal to #FF
01E9 E6 FB          INC POINTH    increment POINTH to new value
01EB E6 FA    NINE  INC POINTL    increment POINTL to new value
01ED 60             RTS           return
01EE C6 FA    SUB   DEC POINTL    decrement POINTL to new value
01F0 A9 FF          LDA #FF       needed for next instruction
01F2 C5 FA          CMP POINTL    is POINTL equal to #FF?
01F4 D0 02          BNE RETURN    branch if not equal to #FF
01F6 C6 FB          DEC POINTH    decrement POINTH to new value
01F8 60       RETURN RTS          return

                RESERVED FOR STACK

01F9 to 01FF
```

LANGUAGE LAB

basic

BASIC MOD & PROGRAMMING HINT

by Heinz Joachim Schilling, DJ1XK
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Two days ago my copy of 6502 User Notes arrived, and because of new format and content I must say: Congratulations !!! You have arranged it into several sections, so it is quite easy to find an object of special personal interest. In my case it is BASIC.

You rised a BASIC question, and I have the solution. The problem of re-loading programs comes from a programming error of the Microsoft people. They did not realize that

1. the ID = $00 or $FF are only operable if the tape was not saved with an ID of $00 or $FF.
2. loading to a changed address using $FF in $17F9 is not possible with their tapes as they use $FF in $17F9 during save!

You have to change the LDA $FF into LDA $FE at $274 , the $FE is at $2744, and that's all! You should have a look into the listing of the KIM-loader to see that ID=$FF only comes into operation after the compare between the $17F9-ID and the tape-ID, in our case the compare matches and the tape is loaded to the same location as it is saved.

You are right that the BREAK-Test should include the 30 as an opcode.

The KIM BASIC hint regarding inputting only a 'return' is good, and I have another one!

In every case you try to use the cursor control codes in PRINT-statements with a semi-colon at the end you run into trouble: after 72 chars (or any other number you inputted at the cold start) the BASIC thinks the line would be complete you inserts a CR-LF, and off you are. This is true in all sorts of games (3 cushion billiard, life and so on). But the solution is so easy: add a simple POKE, and everything will run:

```
1000 PRINT CHR$(9);:POKE 22,1:REM CURSOR RIGHT
```

The POKE goes to the memory cell which holds the position in the line. The storage of the 1 let the BASIC think it was at the beginning of the line and so the inclusion of the unwanted CR-LF is dropped.

Besides, I have made a little program with subroutines of HYPERTAPE and LOAD in the same form as they are used in the Micro Ade Assembler, that means with optical control of the loading. You can see on the 7-segment-display three different states: SYNC, Loading and seeking (that means if your load was with a fault and the loader looks for another ID). This little program has routines for calling these subroutines, and it can start BASIC and can start other programs at a specific address. I use the loader- and save-subs from BASIC too, and so my BASIC is in the memory in 3 minutes instead of 18! Besides, I have made a disassembler printout of BASIC to allow easier corrections to BASIC. I think it would be possible to PROM the BASIC with trig functions, but this would be only possible in 9K, and you would have to change something in the coldstart routine. You must only make a little correction to the "Want SIN..." routine and take the first address after the PROM as beginning of free memory to $78, $79, e.g. the Want Sin prompting will be deleted.

The renumbering program on page 12 seems to be good, but I want to make one in assembler which could be loaded to my spare memory at $0400 and must not be deleted at the end of the operation.

I just remember another little correction to my BASIC: I changed the location $243A to $E5 which allows the use of the DEL key at my terminal instead of the underline to delete a wrong character.

The most important thing during work with BASIC for nay corrections: a disassembler printout!!!!

Then it is very easy to follow the flow through the interpreter and make little changes.

BASIC OUTPUT PAGING MOD

by Dick Grabowsky
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Marvin Dejong asks where to look to make Basic list 16 lines, rather than scoot the program past his eyes so quickly he can't see it.

Microsoft Basic does not use the KIM CRLF routine. Rather, it outputs a CR (0D) and line feed (0A) followed by a number of nulls as defined

in LOC $15. These characters are all transfered to the KIM OUTCH routine. In 9-digit Microsoft Basic, the call to KIM OUTCH is located at $2A51. To limit output, we can intercept this call, count the number of times the CR or LF character pass through our intercept, then halt further output until the operator inputs some character from the keyboard.

The following routine does this by counting the line-feed characters and stopping output until a line-feed is entered via the keyboard. As a bonus, let's add an ability to stop output (i.e. terminate the process) when we've found what we want, or have seen enough. The routine maybe placed anywhere in memory that will not be overwritten by Basic or Basic programs/data.

```
LINCNT  CMP #$0A     ;is it a line feed?
        BNE LINC1    ;no, then output
        INC COUNTR   ;yes, incr the counter
        LDA COUNTR   ;and check to see if
        CMP LNCNT    ;it ='s preset line count
        BEQ LINC2    ;yes, -halt output
        LDA #$0A     ;else, reload line feed
LINC1   JMP $1EA0    ;(KIM OUTCH)

LINC2   LDA #0
        STA COUNTR   ;reset the counter
LINC3   JSR $1E5A    ;(KIM GETCH) get a char
        CMP #$0A     ;line feed?
        BEQ LINC1    ;yes, continue listing
        CMP #$0D     ;return?
        BNE LINC3    ;no, ignore
        JMP $0       ;else, jump to "warm start"


COUNTR  *=*=1        ;line feed counter
LNCNT   *=*=1        ;line count
```

To use the routine, set the address of "LINCNT" at $2A52, $2A53. Preset the values of "COUNTR" to zero and "LNCNT" to the desired number of lines (use HEX). All output will then be limited to the number of lines defined by LNCNT. Since Basic does not use zero page locations from $DD up, $DD and $DE may be good locations to put "COUNTR" and "LNCNT" since this can be done before loading Basic from tape.

When in Basic, the routine can be used to limit output to a specific number of lines by "poke"ing the values of "COUNTR" and "LNCNT" as appropriate.

One additional note, 9 digit Basic sets the base address for programs at locations $4148 and $414A to 41 and 40, respectively. To gain room above Basic for additional software, changing these locations to the address values desired will do the trick. By the way, to check on the authors of Microsoft Basic, enter an "A" in response to the "memory size?" question.

RENUMBER ADDENDUM AND SOME MODS

by Harvey Herman
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I recently sent you a BASIC renumbering program for KIM Microsoft 8K BASIC. In the accompanying letter I noted one restriction about the number of digits in the new line number. Sean McKenna has written me about one further restriction. He notes that numbers after THEN in an assignment, for example, will always be renumbered. Thus, the 2 in 10 IF A = 1 THEN X=2 could be inadvertently changed. He suggests using variables in assignments after THEN (X = V, where V = 2) to avoid the problem.

I also mentioned another renumbering program I use which utilizes a paper tape punch. This program does not have the above problem. If readers are interested in this program I will send it to them on receipt of a SASE and extra loose stamp.

I wrote you recently about the question you posed to your readers about Microsoft BASIC. It is possible to automate the "Y" answer in an initialization routine and I documented the procedure. A further point-4146 can be changed to 4E or 41 if "N" or "A" is the desired response.

In reply to a question posed to me in a private letter I have figured out how to skip all 3 initialization questions and their accompaning messages.

1. To size memory automatically change-

Locations	From	To	
40B9	20	4C	JMP $40CD
40BA	18	CD	
40BB	2A	40	

2. To keep 72 as terminal width

410A	20	4C	JMP $4136
410B	18	36	
410C	2A	41	

3. To answer "Y" to trig functions question and skip message

413A	20	4C	JMP $4145
413B	18	45	
413C	2A	41	

4145	C0	A9	LDA #'Y or 'N or 'A
4146	00	59 or 4E or 41	

AUTOMATIC LINE NUMBER ENTRY PROMPT FOR BASIC

```
0010:
0010:                Sean McKenna
0020:                64 Fairview Ave.
0030:                Piedmont, CA 94610
0040:                January, 1979
0050:
0060:
0061:                NUMBER REVISED VERSION
0062:
0070:                An automatic line numbering input routine
0080:                for 9 digit KIM BASIC.  From command BASIC
0090:                enter # nnnn+ii(sp)CR to begin automatic
0100:                line number sequencing with nnnn.  Each
0110:                line will be incremented by ii.  To return
0120:                to command BASIC enter CR after line number.
0130:                On delete the line number will be repeated
0140:                on the next line of the terminal.  Don't
0150:                forget the space after the increment number
0160:                or you may get no increment at all or a
0170:                strange one.  Because of the decimal add
0180:                the highest line number possible with the
0190:                program is 9999 and 99 is the highest
0200:                increment
0210:
0211:                 Initialization: SEQFLG and TIMNUM must be
0212:                 initialized to $00 before using the routine
0213:
0220:
```

```
0230: 0200           NUMBER ORG   $0200
0240: 0200           INCR   *     $00E5
0250: 0200           SEQFLG *     $00E6
0260: 0200           TIMNUM *     $00E7
0270: 0200           HI     *     $00E8
0280: 0200           LO     *     $00E9
0290: 0200           BASBUF *     $001B
0300: 0200           PACKT  *     $1A00
0310: 0200           SAVX   *     $17E9
0320:                 Set input and output to your routines.
0330:                 Input should echo to output and preserve X.
0340:                 Output should preserve X and ACC.
0350: 0200           INPUT  *     $1000
0360: 0200           OUTPUT *     $1017
0370:
0380:                   Enter here from KIM BASIC INPUT call
0390: 0200 24 E7     START  BIT   TIMNUM If not time to output a line number
0400: 0202 10 14            BPL   INP    Then branch to input call
0410: 0204 A5 E8     LINO   LDA   HI     Otherwise output a 4 digit line number to
0420: 0206 20 6A 02         JSR   OUTNUM the BASIC input buffer and users display
0430: 0209 A5 E9            LDA   LO
0440: 020B 20 6A 02         JSR   OUTNUM
0450: 020E A9 00            LDAIM $00    and clear the TIMNUM flag
0460: 0210 85 E7            STAZ  TIMNUM
0470: 0212 A9 20            LDAIM $20    Output a space
0480: 0214 20 17 10         JSR   OUTPUT
0490: 0217 60               RTS          and return to basic
0500: 0218 20 00 10  INP    JSR   INPUT  Get user input
0510: 021B C9 40            CMPIM $40
0520: 021D D0 0B            BNE   CRQ    If delete input
0530: 021F 24 E6            BIT   SEQFLG and seqence flag is set
0540: 0221 10 46            BPL   RETURN
0550: 0223 A9 FF            LDAIM $FF    then set TIMNUM flag
0560: 0225 85 E7            STAZ  TIMNUM
0570: 0227 A9 40            LDAIM $40    restore delete
0580: 0229 60               RTS
0590: 022A C9 0D     CRQ    CMPIM $0D    If CR
0600: 022C D0 3B            BNE   RETURN
0610: 022E 24 E6            BIT   SEQFLG and sequence flag is set
0620: 0230 30 24            BMI   ENDSEQ go see what to do
0630: 0232 A5 1B            LDA   BASBUF otherwise look at BASBUF
0640: 0234 C9 23            CMPIM $23     did he input a #?
0650: 0236 D0 2F            BNE   CRRET   If not return with a CR
0660: 0238 A9 FF            LDAIM $FF
0670: 023A 85 E6            STAZ  SEQFLG If yes set sequence flag
0680: 023C A9 0D            LDAIM $0D     Output a CR
0690: 023E 20 17 10         JSR   OUTPUT
0700: 0241 A9 0A            LDAIM $0A     and LF
0710: 0243 20 17 10         JSR   OUTPUT
0711: 0246 A2 00            LDXIM $00    Clear HI, LO and SAVX
0712: 0248 8E E9 17         STX   SAVX
0713: 024B 86 E8            STX   HI
0714: 024D 86 E9            STX   LO
0720: 024F 20 90 02         JSR   SETNUM  and go set up HI,LO and INCR
0730: 0252 A2 00     SETLNO LDXIM $00
0740: 0254 F0 AE            BEQ   LINO   send the first line number and return
0750: 0256 E0 08     ENDSEQ CPXIM $08
0760: 0258 30 09            BMI   CLRSEQ  clear SEQFLG if not enough in buffer
0770: 025A 20 C5 02         JSR   INCLN  otherwise add increment to line number
0780: 025D A9 FF            LDAIM $FF    and set the TIMNUM flag
0790: 025F 85 E7            STAZ  TIMNUM
0800: 0261 30 04            BMI   CRRET  and returns with CR in ACC
0810: 0263 A9 00     CLRSEQ LDAIM $00
0820: 0265 85 E6            STAZ  SEQFLG
0830: 0267 A9 0D     CRRET  LDAIM $0D
0840: 0269 60        RETURN RTS
0850:
0860:                  SUBROUTINES FOLLOW
0870: 026A 48        OUTNUM PHA          Puts hex byte in ACC in BASIC buffer as
0880: 026B 4A               LSRA         2 ACII decimal digits and ehoes to user
0890: 026C 4A               LSRA
0900: 026D 4A               LSRA
0910: 026E 4A               LSRA
0920: 026F 20 7D 02         JSR   HXTAS
0930: 0272 20 89 02         JSR   PNUM
0940: 0275 68               PLA
0950: 0276 20 7D 02         JSR   HXTAS
0960: 0279 20 89 02         JSR   PNUM
0970: 027C 60               RTS
0980: 027D 29 0F     HXTAS  ANDIM $0F    Changes hex character to ASCII
0990: 027F C9 0A            CMPIM $0A
1000: 0281 18               CLC
1010: 0282 30 02            BMI   HXI
1020: 0284 69 07            ADCIM $07
1030: 0286 69 30     HXI    ADCIM $30
1040: 0288 60               RTS
1050: 0289 20 17 10  PNUM   JSR   OUTPUT Line number to buffer and output
1060: 028C 95 1B            STAAX BASBUF
1070: 028E E8               INX
1080: 028F 60               RTS
1090: 0290 E8        SETNUM INX          Gets base line number and increment from
1100: 0291 B5 1B            LDAAX BASBUF buffer and places in HI,LO, and INCR
1110: 0293 C9 20            CMPIM $20
1120: 0295 F0 F9            BEQ   SETNUM Ignore spaces
```

```
1130: 0297 C9 2B          CMPIM $2B     If plus sign (+) then go get increment
1140: 0299 F0 18          BEQ   GETINC
1150: 029B 20 00 1A       JSR   PACKT  Otherwise convert to ASCII and store
1160: 029E A5 E9          LDA   LO
1170: 02A0 A0 04          LDYIM $04     Into HI and LO
1180: 02A2 0A       ROT   ASLA
1190: 02A3 26 E8          ROL   HI
1200: 02A5 88             DEY
1210: 02A6 D0 FA          BNE   ROT
1220: 02A8 0D E9 17       ORA   SAVX
1230: 02AB 85 E9          STA   LO
1240: 02AD 8C E9 17       STY   SAVX
1250: 02B0 4C 90 02       JMP   SETNUM  And go look for next one
1260: 02B3 E8       GETINC INX
1270: 02B4 B5 1B          LDAAX BASBUF  Get increment number
1280: 02B6 C9 20          CMPIM $20
1290: 02B8 F0 05          BEQ   GOTIT   If blank done
1300: 02BA 20 00 1A       JSR   PACKT   Convert to ASCII and leave it in SAVX
1310: 02BD F0 F4          BEQ   GETINC  Go get next one
1320: 02BF AD E9 17 GOTIT LDA   SAVX
1330: 02C2 85 E5          STAZ  INCR    put it in INCR and return
1340: 02C4 60             RTS
1350: 02C5 A5 E5    INCLN LDAZ  INCR    Add increment amount to line number
1360: 02C7 18             CLC
1370: 02C8 F8             SED
1380: 02C9 65 E9          ADC   LO
1390: 02CB 85 E9          STA   LO
1400: 02CD A5 E8          LDA   HI
1410: 02CF 69 00          ADCIM $00
1420: 02D1 85 E8          STA   HI
1430: 02D3 D8             CLD
1440: 02D4 60             RTS
```

A NEW COMMAND FOR BASIC

Dick Grabowski
HDE INC.

To implement the "GET" command in KIM BASIC by Microsoft, change the following:

at location $2AEA-$2AEC enter A0 00 A2 1A

The "GET" command allows terminal input and test of a single character without the need to enter the "RETURN" key. One example is in terminal use where you want to hold some material on the screen until the user signals completion:

```
1000 PRINT:PRINT "ENTER SPACE WHEN READY";:GET A$:
     IF A$<>" " THEN 1000
```

This will repeat the prompt "ENTER SPACE WHEN READY" until a space is entered, then fall through to the next program step. Of course, many other uses exist.

GET A ---returns the numeric value 0-9
GET A$---returns the alpha value A-Z

Editors Addition —
Bob Kurtz of Micro-Z mentioned that he got the "GET" command working by changing location $2AEE from $D0 to $F0.

The GET command will simplify the user interface considerably.

PRODUCT REVIEW

by the editor

Review of Harvey Hermans Basic Enhancement Package as mentioned in Issue #13 p. 12.

Besides what I mentioned in issue #13 you also get a method for using KIMs ST key for stopping the program in a controlled manner, the ability to append Basic programs and subroutines from cassette tape, and a fix for a bug in Basics cassette save routine (also see Herr Schillings letter in the Basic section of this issue for the same fix).

For 15 bucks you get five pages of info. Four pages of explanations and sample printouts of the Basic mods and the fifth page is a hexdump of the mods.

There's no doubt that this is a useful package of info for the Basic user. My only complaints are that the price is a little steep ($7.50 would have been more like it) and the source codes for the mods is not included (Mr. Herman indicated he would sell the source code for an additional 15 bucks).

The "real-time clock" is actually a "tick" counter and not a time of day clock. Could be useful in games etc.

PRODUCT ANNOUNCEMENT

Bob Kurtz of Micro-Z has announced that he is making available his Basic mods which add Hypertape and most importantly the ability to save and load Basic data as well as programs. (This is one of the shortcomings of the 6502 version of Microsoft Basic. It's hard to believe that this ability wouldn't be part of the original program specs.) The ability to save data is a very important one as it enables one to maintain and update data files of such things as income info for tax time, scores for the plant bowling league, handicaps for the local golf course, maintaining your check book, etc etc.

The package also includes a 60 + page Basic manual which explains each command in detail and includes many programmed examples. I have the manual and can attest to its completeness. The only thing this manual doesn't include is any zero-page usage data as was found in the Basic documentation included with the Basic from Johnson Computer.

Anyhow, Micro-Z is asking $35 for their Basic enhancement package and this uncludes the manual. Contact Micro-Z Co, Box 2426, Rolling Hills, Ca 90274.

BASIC 'USR' FUNCTION INFO

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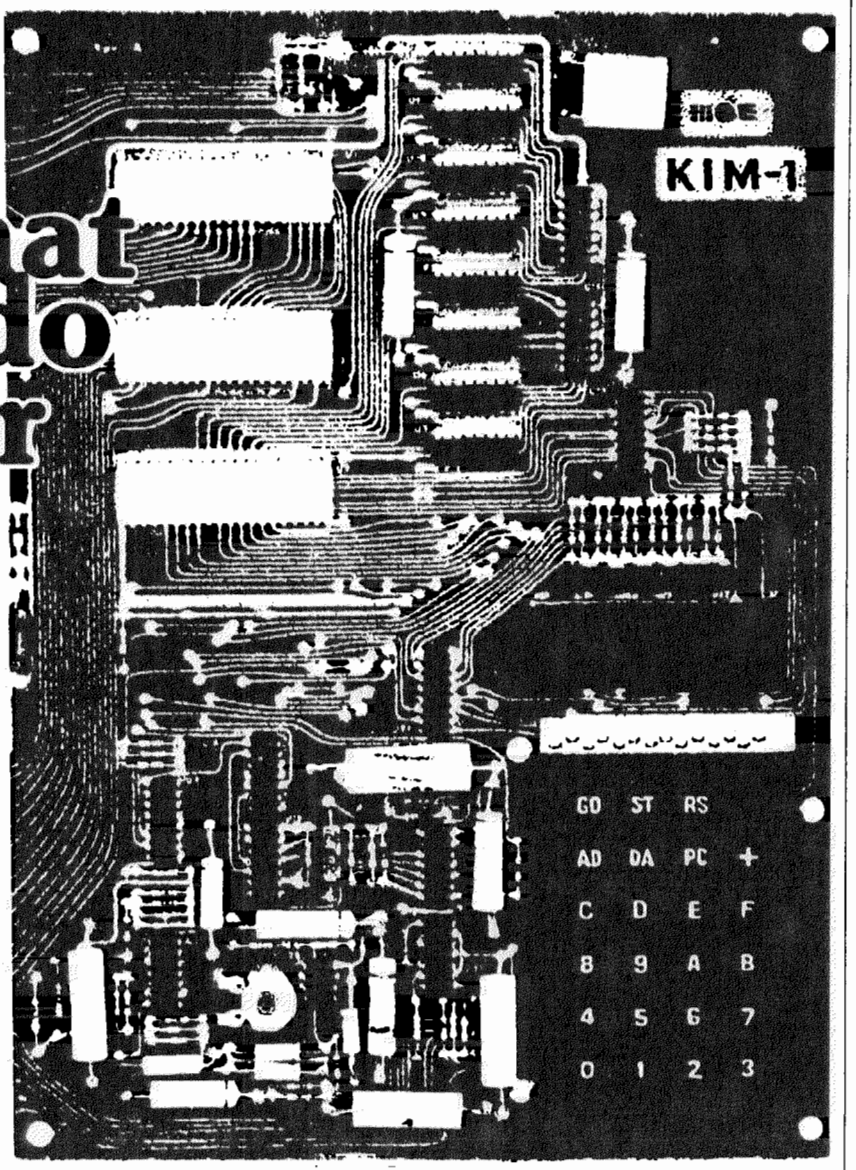
Microsoft BASIC users should note that "AYINT" does not work as described in the instructions for Microsoft BASIC (at least in my version of it.) The USR argument is returned to $00B1(H1) and $00B2(LO), and not to Y and A. After having some problems with the USR statement, I wrote to Microsoft and they repsonded with the above information (apparently not having had this brought to their attention before according to their letter). You should check your version out to see what it does, as newer ones may have this changed either in the program or the instructions. This is applicable for the KB-9 version. I cannot verify that the following work, but Microsoft wrote that the return is to AB(LO) and AC(HI) in KB-6, and B4(LO) and B5(HI) in the ROM version. I would check the HI-LO arrangement carefully, since they had them reversed for the KB-9 version; they work as stated above in my BASIC.

FROM THE EDITOR: The 'USR' function in Microsoft Basic is a kluge at best. Does anyone know where the 'USR' routine is located in Basic so we can make it work right. Tiny Basic has a much better machine language interface.

Do you know what you can do with your KIM?

If not, we have a few suggestions . . .

Two books, whose programs are now available on computer program tapes, will give you numerous suggestions and complete directions for some unique and fun applications for your KIM.



THE FIRST BOOK OF KIM (by Jim Butterfield, Stan Ockers, and Eric Rehnke) is the book all KIM users have been waiting for. In it, you'll find a beginner's guide to the MOS Technology KIM-1 microcomputer as well as an assortment of games and puzzles including Card Dealer, Chess Clock, Horse Race, Lunar Lander, and Music Box. The authors go into detail on how you can expand your KIM from the basic small-but-powerful KIM-1 system to a huge-and-super-powerful machine. Also featured are diagnostic and utility programs for testing both the computer and external equipment (such as cassette recorders), expanding memory, and controlling analog devices. (#5119-0, $9.95) Now available are easy-to-use computer program tapes that feature the 28 recreational and 13 utility programs found in THE FIRST BOOK OF KIM. Tape 1 (#00700) and Tape 2 (#00800) have 14 recreational programs each, and Tape 3 (#00900) has 13 diagnostic and utility programs. All three tapes are $9.95 each.

HOW TO BUILD A COMPUTER-CONTROLLED ROBOT (by Tod Loofbourrow.) "Finally someone has written a book on robot building with microprocessor/microcomputers and a good one at that! . . . a gold mine of useful information on interfacing microcomputers to the real world — and beyond." *Computer Dealer.* You'll experience the thrill of creating an intelligence other than human when you see how "Mike" grows from totally under your control, to seeing and feeling his environment, to responding to voice commands. This book details that creation by giving step-by-step directions for building a robot that is controlled by a KIM-1. (#5681-8, $7.95). The five complete control programs for a robot are clearly documented in the book and are available on a computer program tape. (#00100, $14.95)

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focal

Lots of neat mods are in store for FOCAL. We're going to add a cassette save & load facility, a Basic-like data statement, output to KIM's seven segment display, the ability to handle arrays of strings, an improved print command, a machine language subroutine call and a few minor fixits and speed-up mods.

Before we do all this, however, we need some room. The present size of the Aresco V3D is about 6K so let's stretch it out to an even 8K and give ourselves a little breathing room. If you examine the listings (love them listings!), you'll notice that the user program must start right after Focal because of line number 00.00 at $35EB.

(One problem: all these mods pertain to V3D which is distributed by Aresco and not necessarily to FCL-65E which is distributed by 6502 Program Exchange. The symbolic addressing info might pertain to FCL-65E but since I don't have a listing of FCL-65E, I can't be sure. FCL-65E might be an updated version of V3D but I can't be sure).

Extend V3D FOCAL to 8K by moving $35EB through $360A to $3FE0-$3FFF. This moves the line 0.0 startup message to the top of the 8K block that will be used by FOCAL. Some zero page pointers must also be changed to allow for the above mod.

```
change:  TEXTBEG $002F  FROM $EB TO $E0
                 $0030  FROM $35 TO $3F
         PBADR   $0031  FROM $09 TO $FE
                 $0032  FROM $36 TO $3F
         VARBEG  $003E  FROM $0A TO $FF
                 $003F  FROM $36 TO $3F
         VARST   $0040  FROM $0A TO $FF
                 $0041  FROM $36 TO $3F
         VAREND  $0042  FROM $0A TO $FF
                 $0043  FROM $36 TO $3F
         PDLIST  $0053  NO CHANGE
                 $0054  FROM $3F TO $5F
```

This is the FOCAL pushdown stack and should be set to some convenient page up out of the way of FOCAL programs. $5F assumes a 16K system.

Another thing that must be improved is the way FOCAL sets up zero-page. Actually, it doesn't. I really can't understand why the implementers overlooked this problem. Oh well...it's easy to fix. At $3F00 add the following zero page intialization routine. $3F00 will become the new cold start address.

```
         ZPAGE  = $0
         ZSTORE = $3F10
         LENGTH = $BF      ; NUMBER OF BYTES
         STARTF = $2000
         *=$3F00
CSTART   LDX #0          ; INITS THE LOOP COUNTER
ZLOOP    LDA ZSTORE,X    ; START MOVING DATA
         STA ZPAGE,X
         INX
         CPX #LENGTH+1
         BNE ZLOOP
         JMP STARTF      ;   PAGE IS SET UP
                         ; GO TO FOCAL
```

Ok now, we have stretched out FOCAL to 8K and added a Z page initialization routine. What next? We'll start adding mods from $35EB-$3EFF.

More next time.....

tiny basic

Oops! In issue #13, I left out the mod that must be made to the IL at $0A26. Here it is:

0A26 1E NX NX on REM instead of NS.

In the next issue, we'll be presenting a very comprehensive string capability for TB as well as a cassette save and load ability. (I ran out of room in this issue). Must be a good number of Tiny Basic users out there. Have you done anything neat with TB? Let us know.

forth

Nothing new to report here except that by issue #15 or #16 I hope to be announcing availability of FORTH for KIM. Preliminary versions are actually operational at this point, but documentation has to be written and other details have to be worked out. This version of FORTH was written to conform to the implementation info presented in the Caltech FORTH manual. A complete source listing will be available.

Beware - just because it's called FORTH don't mean it really is. Before you purchase any package called "FORTH" make sure it conforms to the "international standard" presented in #13.

xplo

Ready for something new? Take a look at XPLO. This is a block structured compiling language that is quite a bit different from BASIC or FOCAL and more along the lines of a subset of ALGOL or PASCAL. An article on XPLO appeared in Kilobaud (Feb 79 p. 24) which should enlighten you on the ins and outs of this new addition to the 6502 users arsenal.

I purchased XPLO from the 6502 Program Exchange, 2920 Moana, Reno NV 89509. Get their catalog for $1. Lots of good software from this group Check them out.

Here's a sample HILO program written in XPLO to give you an idea what it looks like.

```
'CODE' CRLF=9,RANDOM=1,INPUT=10,TEXT=12;
'INTEGER'  GUESS,NUMBER,INCORRECT,TRY;
'PROCEDURE'      MAKEANUMBER;
'BEGIN'
    NUMBER:=RANDOM(100);
'END';
'PROCEDURE'      INPUTGUESS;
'BEGIN'
        GUESS:=INPUT(0);
'END';


'PROCEDURE'      TESTGUESS;
'BEGIN'
    'IF' NUMBER=GUESS 'THEN'
    'BEGIN'
        TEXT(0,"CORRECT!!");
        TRY:=1;
    'END'
    'ELSE'
        'IF' NUMBER<GUESS 'THEN'
        TEXT(0,"TOO HIGH")

        'ELSE' TEXT(0,"TOO LOW");
CRLF(0);
'END';


'BEGIN'
INCORRECT:=0;
TRY:=INCORRECT;
MAKEANUMBER;
'WHILE' TRY=INCORRECT 'DO'
            'BEGIN'
                    TEXT(0,"GUESS ");
                    INPUTGUESS;
                    TESTGUESS;
            'END';
'END'
```

The 6502 Program Exchange also offers a very powerful text editor which is based on the DEC TECO editor. TEC65 is a line oriented (no line numbers) and allows for some very complex editing editing macros. For instance, you could conceivably convert an assembly source file from one assembler format to another. TEC65 includes a cassette operating system which lets you save and load text files.

I've had this editing language running on my machine and am quite impressed with its power. Check it out!

sym!

ACCESSING THE SYM DISPLAYS

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Owen Sound, Ontario

I got my new SYM-1 a couple of weeks ago, and I love it. But there's a lot of work to be done- it's not that similar to KIM.

Outputting on the display is a lot different- instead of using F9, FA and FB, you have to treat each 7-segment display as a unit, and get it into DISBUF at A640 (left display) through A645 (right display). But since DISBUF is in write-protected RAM, you have to call ACCESS at 8B86 first to unwrite the RAM.

I've enclosed a little SYM-1 program to output the characters, and shown the segment coding. The program as written will display squirrely characters as indicated. Any character can be displayed by changing the coding in 021A through 021F, using the indicated coding, and others can be found starting at location 8C29 in the monitor.

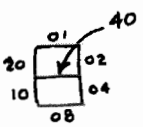
This program may help novices like myself to get the feel of SYM. I haven't had time to figure out the counter yet.

Maybe some bright USER can come up with a way to hook up Don Lancaster's TVT 6 5/8 to a SYM.

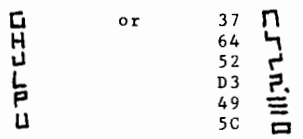
Sorry that Jack Cowan had trouble with his Solid State 4K board. Mine worked the first time with my KIM (no bad chips), and when I plugged it into my SYM, after changing the addresses, it also worked perfectly.

```
ACCESS   =  $8B86
DISBUF   =  $A640-45
SCAND    =  $8906

0200  A2 05            LDX   @ 05
0200  20 86 8B  GETCH  JSR   ACCESS
0205  BD 14 02         LDA   TABLE,X
0208  9D 40 A6         STA   DISBUF,X
020B  CA               DEX
020C  10 F7            BPL   GETCH
020E  20 06 89  DISPL  JSR   SCAND
0211  4C 0E 02         JMP   DISPL
0214  79        TABLE  .BYTE 'ESCAPE'
0215  6D
0216  39
0217  77
0218  73
0219  79
```



Blank = 00, Decimal = 80
SEGMENT CODE



Other character codes start at Mon. address $8C29. To change display change coding in table 0214-0219.

SYM NOTES & KIM-4 COMPATIBILITY

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White Plains NY 10607

I note that some information on the SYM is being included in the 'USER NOTES'. The SYM looked like a reasonable way to improve a KIM based system so I looked into this. The Synertek liturature states that the SYM is usable with any KIM based motherboard. To check, I wrote Synertek and asked specifically if it would work with the KIM-4. They replied that it would. So I got one and tried it, and can report that it does not work with the KIM-4. The trouble was tracked down to the fact that the KIM-4 data buffers are enabled at the wrong times. Thus the KIM-4 has to be altered for proper decoding. After cooling down somewhat about this development, I looked into the problem and came up with a solution, but not an optimal one.

The following alteration will result in the KIM-4 being enabled for all addresses below $8000, and disabled for all above (and including) $8000. Since the SYM in its full glory will utilize almost all of the addresses above $8000, this scheme makes sense. However, if you want to fit in some RAM in the unused high memory positions, you will have to resort to more extensive surgery on the KIM-4. The mod here requires that the lower 1K of memory be on the KIM-4, which makes the RAM on the SYM unnecessary. A simple change will disable the low 1K ($0000-$03FF) on the KIM-4 and allow its use on the SYM. However, since this makes filling in the rest of the first 8K somewhat awkward, I prefer to ignore the SYM RAM (which should be removed, especially if either set of RAM's on the same address can be write protected.)

First of all, you will have to remove chip U5 of the KIM-4 (the 7423) and replace it with a socket. Since you will in all probability destroy U5 in this process, be sure you get another 7423 before starting. Note that some pins make their connection at the top of the board only. If a tiny bit of solder is placed on these pins at the base before putting the socket on the board, it will melt and make contact if you heat the pin adequately. Replacing the 7423 into the socket will leave the KIM-4 in its original state for the KIM.

Now you will connect a 16 pin dip header to a 14 pin socket using the following connections:

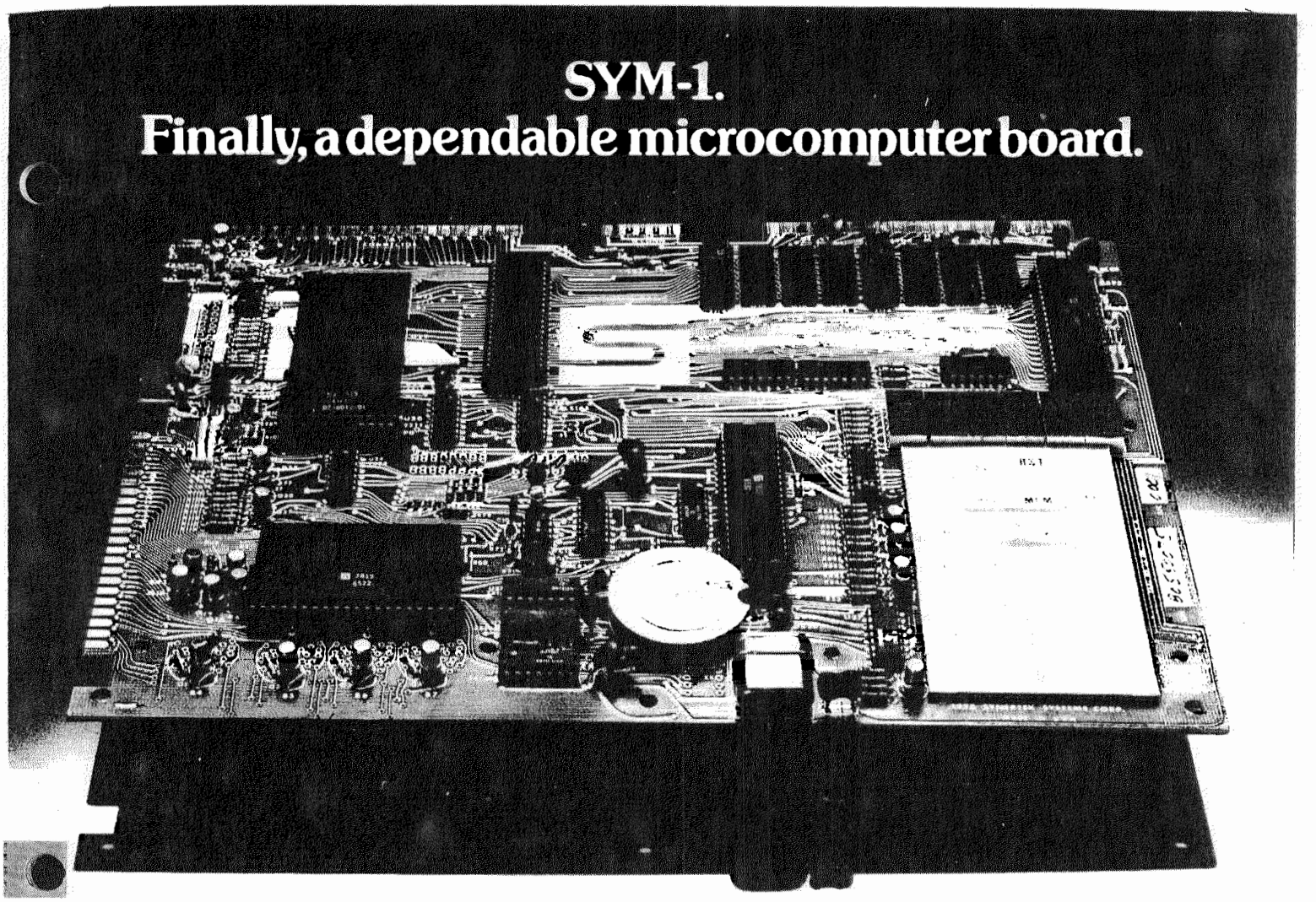
16 PIN (TOP)	14 PIN (BOT)
4	9
6	12
7	8
8 GND	7 GND
9	3
10	2
12	1
16 VCC	14 VCC

Now connect pins 10 and 11 together on the 14 pin socket, and do the same with pins 13 and 14. Be sure to use covered wire as they will have to cross over each other. I made my connections about ½ inch long so that the 14 pin socket sets just above the 16 pin dip header. Using solid hookup wire makes for a fairly firm package. Being careful to observe the location of pin 1, put a 7400 (or 74LS00) into the 14 pin socket. Now plug the converter into the socket for U5 in place of the 7423. The KIM-4 is now enabled for the lower 32K and disabled for the top 32K. The SYM should now work when plugged in, but not the KIM.

To disable the KIM-4 for the first 1K, do not connect pins 13 and 14 on the 14 pin socket together. Instead, run a connection from KO on the applications connector (pin A-B) to pin 13 of the 14 pin socket. Note that there is an unused nand gate in the 4700 that can be used for additional coding if desired. (The info in this paragraph has not actually been tried yet).

Having made the above conversion, I was then in a position to determine whether or not KIM programs that use TTY or CRT I/O could be successfully transferred and used after changing the I/O vectors and/or JSR's. This led to the next problem. Transferring programs to the SYM system from the KIM system sounds easy since SYM has a KIM format tape input program. But it ain't easy. First of all, as noted in the Feb ('79) MICRO, the SYM stops when it detects a '2F', thinking it is the end of file marker. Those '2F' bytes that are not EOF's have to be changed to something else before transfer, and then changed back afterwards. (I intend writing a short program that will do this in the near future.) The next problem is that SYM will not read tapes made with Hypertape; you must muse the KIM monitor speed. I suppose that a program could be written to read Hypertape, and wonder why Synertek didn't make theirs flexible enough to do this. (If I read the monitor proram correctly - and this is not easy to do because of all the branches and jumps it uses - the number of pulses required per bit is programmed into the monitor and cannot be changed.)

SYM-1.
Finally, a dependable microcomputer board.



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I finally managed to transfer Tiny Basic to the SYM system, and after changing the I/O vectors, found that it worked. One point that I noted was that the SYM monitor converts lower case input into upper case, but this looks like it would not be too hard to get around.

Another point of difference in the KIM and SYM. I have found the KIM tape I/O to be extremely reliable and not critical in the recorder used or the settings used. For the short bit that I have used the SYM, I have found it to be extremely sensitive to the recorder volume and tone settings, particularly for the high speed format. It was thoughtful of Synertek to provide a visual means of setting the volume and tone controls for proper reading of the tape (using a sync tape). I guess one must decide which is better - fast tape I/O but critical settings, or slower but surer tape I/O.

ADDENDUM

Since writing the above I have noted another problem in using the SYM with the KIM-4. KIM outputs K1,2,3,4 are wire-or'd together on the KIM-4 and pulled up with a resistor (R2). The equivalent lines on the SYM are not open collector lines and probably should not be wire or'd. No harm came to the 74LS138 on the SYM during the short time I used it without noticing this (at least no noticeable harm). These four lines can be separated on the KIM-4 by cutting the traces between them (where the connectors are soldered to the KIM-4 board). K4 (A-F) can be disconnected from R2 by removing the through plating where the line transfers to the bottom of the board. A four position dip switch could be hooked up to connect or disconnect the lines.

WUMPUS & MUSIC BOX MODS FOR SYM

Jim Adams
17272 Dorset
Southfield, Mi 48075

SYM Users: Make the following modifications to Stan Ockers' WUMPUS program in The First Book Of KIM to use it on your machine.

LOC	FROM	TO	
35C	E7	29	
35D	1F	8C	
365	E7	29	
366	1F	8C	
376	14	47	ASCII G (GO key) to pitch Gas
2A6	06	04	
2A7	17	A4	
2E1	E7	29	
2E2	1F	8C	

Replace 200 thru 257 with

```
200  84 DE 85 DD 20 86 8B A0 05 B1 DD 49 80 C9 80 F0
210  1F 99 40 A6 88 10 F2 A2 0A 86 DB A9 52 8D 1F A4
220  20 06 89 2C 06 A4 10 F8 C6 DB D0 EF E6 DD D0 D7
230  60
```

Replace 258 thru 271 with

```
258  20 AF 88 C9 47 F0 05 20 75 82 B0 F4 60
```

Make the following modifications to Jim Butterfield's MUSIC BOX program in The First Book Of KIM to play music on your on board speaker.

LOC	FROM	TO
20B	BF	0D
20C	8D	20
20D	43	A5
20E	17	89
219	00	60
24C	A7	06
255	27	08
270	42	02
271	17	A4

ATTENTION "VIM" AND "AIM-65" USERS!!! THE SAN FERNANDO VALLEY KIM-1 USERS CLUB IS EXPANDING ITS MEMBERSHIP TO INCLUDE THESE TWO NEW AND EXCITING MICROCOMPUTER SYSTEMS WE MEET AT 7:30 PM ON THE SECOND WEDNESDAY OF THE MONTH AT 20224 COHASSET #16, CANOGA PARK, CA 91306 CALL JIM ZUBER AT (213) 341-1610 IF YOU HAVE ANY QUESTIONS.

aim!

MANUAL CORRECTIONS

Jody Nelis K3JZD
132 Autumn Drive
Trafford Pa 15085

I have had a Rockwell AIM 65 for three weeks now and I can only say one thing: Fantastic machine!!!

The AIM is following a one year session with a KIM-1. The 8K monitor in the AIM takes care of a lot of the things that the KIM monitor needed additional software to handle.

The text editor is slick especially for we typists who make a lot of mistakes. Entering a program in mnemonics is a step up from all Hex Op Codes.

The user's guide shipped with the AIM was hurridly put together since it held up shipment of the hardware. To help others who may have an AIM 65, I'm passing along several items that I believe to be incorrect in the user's guide (October 1978 issue).

Page 2-19 A step is missing in the program entry for this example. Between the "AND #0F" and the "BRK" there should be a "STA #41".

Page 2-25 At the top of the page, the display register format should read: PC P A X Y S

Page 3-20 There is a problem with the form given for the (indirect),Y addressing mode. See the separate sheet that discusses that subject.

Page 3-23 Under using the K command:

1. Type K. AIM 65 will repsond with: <K>*=
2. Enter the starting address in hexadecimal. AIM 65 will respond with: <K>*=0300
3. Type return. AIM 65 will respond with: /
4. Specify the number of instructions.. ETC.

Page 9-11 The syn test pattern program has multiple errors in it. This is liable to have a lot of people wearing out VR1 or spending a lot of time trouble-shooting an OK tape recorder. I have included a corrected program disassembled from the AIM 65 on a separate sheet.

Page 11-3 The Olivetti type no. 295933R35 thermal paper that is refered to can't be located in the Pittsburgh area using that number. In fact all of the Olivetti Dealers I talked to were unable to come up with any 2¼ inch wide paper at all. I have found that Texas Instruments #TP-27225 thermal paper is the right size and price (3 rolls for $3.69) and is available anywhere that TI calculators are sold. I haven't tried the SEARS paper yet but the catalog at least says it exists. In a pinch, Radio Shack sells 3 smaller rolls for $2.79 that will work also (Cat. No. 65-706).

Page A-1 There is a problem with the form given for the (indirect),Y addressing mode. See the separate sheet that discusses that subject.

Page K-10 The disassembly listing on this page and the next have been interchanged.

Hopefully these corrections will aid any other new AIM owners get aquainted with their machine.

more...

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AIM 65 User's Guide October 1978 edition page 9-11

Corrected SYN test pattern program

```
END

/03
 0300 20 JSR F21D
 0303 20 JSR F24A
 0306 4C JMP 0303

<K>*=0310
/11
 0310 A2 LDX #00
 0312 A9 LDA #CE
 0314 20 JSR EF7B
 0317 20 JSR EDEA
 031A A2 LDX #00
 031C A9 LDA #D9
 031E 20 JSR EF7B
 0321 20 JSR EE29
 0324 C9 CMP #16
 0326 F0 BEQ 0321
 0328 D0 BNE 0310
```

CONTRADICTIONS & CONFUSION IN THE TABLES OF ADDRESSING MODE FORMATS FOR USE WITH THE AIM 65 MNEMONIC ENTRY MODE

On the AIM 65 Summary Card:

The operand format given for the (indirect),Y addressing mode is incorrect. Both the (HH,Y and the (HH,Y) formats, when entered, end up being decoded as an (indirect,X) opcode. Needless to say, this bombs a program badly!!

In the AIM 65 User's Guide on page A-1:

The same comments as above apply.

In the AIM 65 User's Guide on page 3-20:

One of the operand formats given for the (indirect),Y addressing mode is correct here. The (HH)Y works fine. The (HH,Y) format given here is no good as noted above.

SUMMARY:

The (HH)y operand format on page 3-20 is the only one given that runs properly. By experimentation, I have also found that (HH),Y also works and should be listed as the alternate for those who like it longer but correctly written.

I also noted that all three of the sources of information on the mnemonic instruction operand listed above have an addressing mode listed as (absolute indirect). I'm no expert on the 6502, but I know of no such addressing mode!!

[EDITORS NOTE: What about JUMP INDIRECT?]

VIDEO & TVT-6

POLYMORPHICS VIDEO/KIM INTERFACE

by Mike Firth
104 N St Mary
Dallas Tx 75214

I am using a Polymorphics Video Interface with my KIM-1. My purpose here is to describe what I did to make it work (besides spend money), which was simpler (except for my mistakes) than I thought it would be. Some of what I have to say will be applicable to using an S100 memory board, since the VDM is memory mapped.

I selected the Polymorphics board because, at the time, it was the only display that would give me both upper and lower case (which I needed for editing) along with graphics. I felt for my purposes, graphics would be more useful than the reversed background offered on other S100 boards. (Besides I have worked on terminals with white background and the glare bothers me.) I also wanted to have the option of displaying control characters, which SWTC and other TVT's usually don't. I wanted software control.

The graphics on the Polymorphics board consists of using the lower six bits of the word to each control one small square fitted in three rows of two each that fill all the space taken by a letter. That means the graphics fit edge to edge. One letter character (1111111) fills a portion of the block, like typing capitals on top of each other, thus ■.

One problem with the graphics is that some strange early decision decided that having bit 7 (most significant bit) set (=1) would be ASCII character, while unset (=0) would be graphics. One could add and remove the bit with software, but I am going to invert the data line to the video board so tests, et.al. are easier.

Any S100 board provides many control lines because of the way the 8080 accesses memory and I/O. The 8080 requires separate data in and data out buslines and also must allow for I/O Ports that are activated with address lines and an a PINT line. That also means that there has to be a control for memory read and another for memory write, which there is. Also, since the 8080 is an early device, really odd blips can appear on the address lines while the CPU is internally working, so there are timing restrictions.

We are fortunate because the address lines stay valid for the entire clock cycle and because the data lines are bi-directional. Since the video board has both in and out buffered, we can just tie the appropriate lines (eg. bit 7 in and bit 7 out) together.

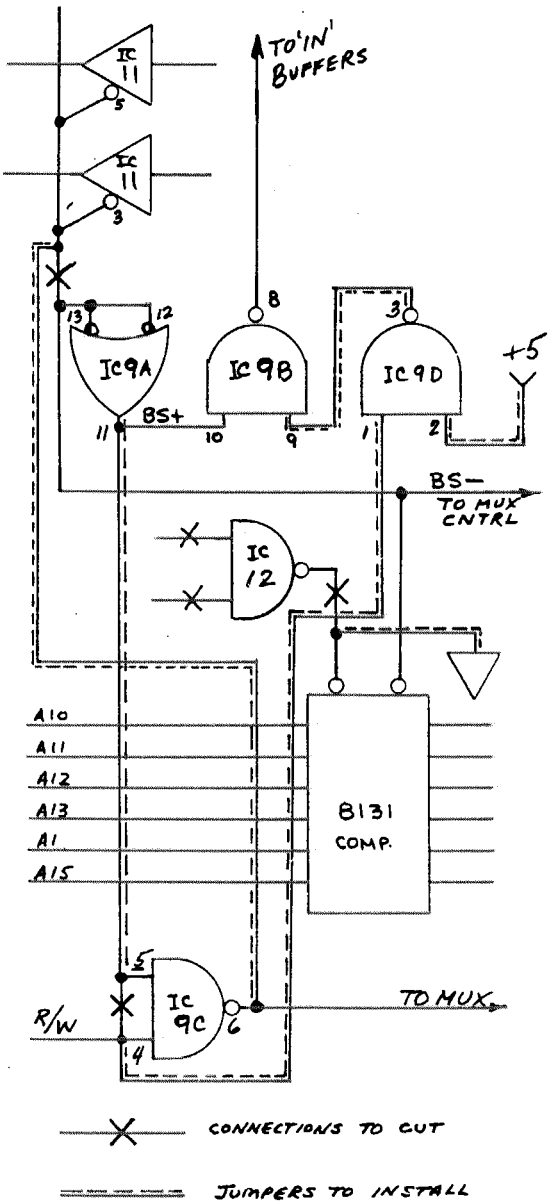
The RAM R/W line from the KIM turns out to be the only line we need to control the access to the video board. IF WE ARE WILLING TO ADD A COUPLE OF JUMPERS ON THE BOARD AND CUT TWO TRACES, we don't need any chips off the board. (What I am about to describe can be done off the board, sort of.) All of the changes take place in a one inch square area on the board.

We take advantage of an unused gate in IC9, a 74LS00, and we cut a trace to take advantage of another gate originally used as an invertor. The other trace to cut is the one that controls the data bus from the board to the computer. As wired, it is always connected, except during a write, when it goes tristate. By installing a jumper, it will be tristate except when the video board is actually addressed.

(Editors Note: The I.C. numbers and the pinout refer to an early model of Polymorphics VTI-64 Video Board. I have the Rev 'F' version and had to do some transposing of I.C. numbers and pinouts, but got everything working OK.)

As shown on the circuit, BS- goes low when the proper 1K of memory is addressed. This is inverted through IC9A, then is usually NANDed with 8080 memory write to control the data buffers into the board. We are going to replace MWR+.

We bring in the KIM RAM R/W line on pin 47 to IC9C as usual. But if this is all we did, the inverted signal would messup the video display EVERY TIME WE DID A WRITE OPERATION ANYPLACE. So, we cut the trace to pin 5 if IC9 and run a jumper from pin 11 to pin 5 of IC9 (arn't we intimate). This insures that pin 6 is low only during access to this block. We then install a jumper from IC9 pin 6 to IC8 pin 3, which controls the tristate (and is next to IC9).



MODS TO POLYMORPHIC VTI-64

Two more jumpers remain. One goes from pin 4 of IC9 to pin 1, carrying the RAM R/W signal to the unused gate in IC9 to use it as an invertor. The output of IC9D (pin 3) is jumpered to IC9B (pin 9) to replace the 8080 MWR+ mentioned earlier. Also, pin 2 of IC9 has to be jumpered to +5 (better practice) or to pin 1.

And that is that. Connect the video board to a monitor, plug everything in and wait. The Polymorphics manual suggests aid for the board. If you get a good stable display, write a program that will load a regularly varying bit pattern into successive locations. If the display shows the same character repeated 2 times, or four times, you probably have miswired something and lost a data line or two (I did, two lines were on the wrong pins on the S100 connector). If you can't access a part of the screen, or the program writes over some areas and doesn't touch others, then an address line is buggy. You should note that even if you only have 16 lines 32 characters long (512 characters), the video board takes up 1K of memory, since it is A5 that is ignored. This save rewriting some software if you add the other 32 later.

With KIM, you can use the monitor to load (and read) any location one-by-one. KIM accesses the memory periodically, which you will note as a line on the screen which disappears if you access elsewhere.

TVT-6 NOTES & RAM EXPANSION

by Milan Merhar
697 Boylston St
Brookline Ma 02146

More TVT-6 stuff and another way to fill the lower 4K hole in KIM.

I read the letter in #13 re the TVT-6 and I thought 1'd pass along some comments.

My cassette copy of the TVT-6 programs from PAIA were very corrupt. Obviously, they were keyed in, not checked, and recorded. Check the programs against the listings before running.

One listing error for the cursor routine: the contents of $0185 should be $03 rather than $01.

Dennis Chaput's problems with the cursor routine not working can be traced to Don Lancaster's cryptic note at the end of the cursor program listing: "To protect page entry, load 00F3 04, to enable page entry, load 00F3 00".

This initializes the accumulator to 04 or 00 via KIM's monitor at run time and therefore Does Nothing!

Obviously, Lancaster meant to initialize 00F1 to 04 or "initialize the status byte to disable interrupts" to protect the page and initialize 00F1 to 00 or "enable interrupts" to access the cursor routine normally.

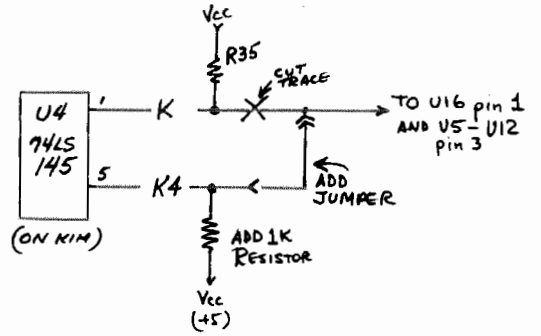
Also note that "Erase to end" and"Sparehook" comments are reversed in the cursor program commentary. ASCII 13 is "erase to end of line", ASCII 12 is "space".

If you're running Tiny Basic or the TVT-6 from low memory, you usually want to expand memory at low addresses rather than start all over again at 2000 hex and up. Most suggestions to squeeze 4K of RAM into the lowest memory space involves fancy bussing of individual chip selects to each 1K of RAM to be added. There's an easier way!

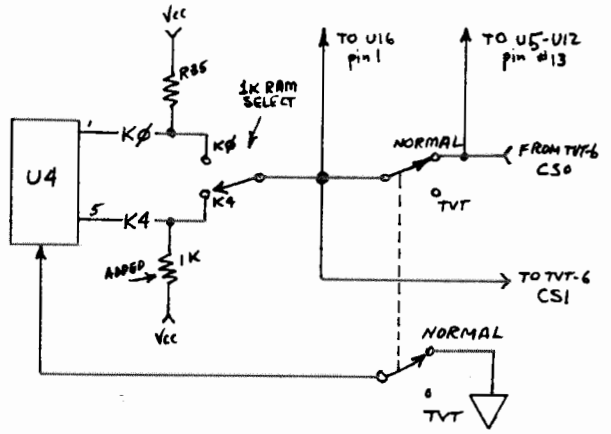
Set your commercially available 4K memory board to fill addresses 0000 hex to 0FFF hex and move KIM's 1K RAM to addresses 1000 hex to 13FF hex.

This gives 5K of contiguous RAM for use with Tiny Basic at 0200 hex or such.

The mod requires a jumper wire and one 1000 ohm resistor to be added.



Please note that "page zero" and the stack are now physically in the 4K RAM board which must be present for the monitor to function. Incorporating this mod to the mods for the TVT-6 gives something like this:



The SPDT switch selects whether the KIM 1K RAM is at 0000 hex to 03FF hex (with the 4K RAM removed!) or at 1000 hex to 13FF hex (with the 4K RAM present)

The DPDT switch is for normal use with the TVT-6 out of its socket.

The TVT-6 can be wired up to the 4K board as discussed by Michael Allen in #13 or can work out of KIM's 1K RAM at 1200 hex to 13FF hex. Patches are simple: The SCAN routines work is written: the cursor is changed by adding 10 hex to the contents of these locations: 0106, 010A, 016E, 0185, 01A0, 01C7, 01DC.

If you are using Tiny Basic, move the cursor routine to 1100 hex and Tiny Basic can have 1½K for user programs from 0B00 hex to 10FF hex. Make sure to initialize Tiny's program space pointers to keep from overwriting your cursor program & display memory in a normal "cold start".

INTERFACING TO THE TVT-II

by John M. Rensberger
1920 NW Milford Way
Seattle Wa 98177

The KIM-1 TTY input and output interface nicely and simply with the CT 1024 TV Typewriter II. However, discovering how to effect this was not easy. MOS Technology supplies no information in their otherwise very extensive literature.

I finally discovered, after 50 hours of searching for a problem in the serial interface and UART of the TVT II, that there is no parity bit, the 8th bit is a 1, and the polarity of the signal as it comes from the transistor interface of Rick Simpson (July User Notes Vol 1) is inverted with respect to the RS232 input requirements of the TVT II serial interface.

Therefore, users attempting to make this interface should use or beware of the following conditions:

1. Omit the inverter in Simpson's circuit.
2. Program the serial interface of the TVT II for NO parity, bit 8=1.
3. I used neither ground nor the -5 volt option on Simpson's circuit. (*EDITORS NOTE: I didn't understand this one*).
4. Lower the resistence of the RS232 input of the TVT serial interface by replacing R-19 (1K) with a 300 resistor.

Knowing the correct bit pattern and that the polarity from the KIM system is correct without inversion should make the interfacing task very simple for anyone wishing to use a TV typewriter as a terminal.

Gary and Lisa Rensberger (ages 14 and 16) have completed a machine language program for KIM that will work with either TVT II or TTY. They would be delighted to hear from users who would like a TIC-TAC-TOE game (700 bytes) in exchange for any other game (listing or KIM compatible tape).

CASSETTE stuff

MAKE A SHORT CASSETTE

Ted Beach - K4MKX
5112 Williamsburg Blvd.
Arlington Va 22207

Regarding your search for C15 tapes, I gave up on that idea long ago. Instead, what I started to do originally was buy "cassette repair kits" sold by Lafayette Radio for about 69 cents each. These are tape housings with a leader from spool to spool. I then spliced in my required length of tape which I cut off of a good quality C60 tape. Radio Shack and Lafayette both have inexpensive (about $4.00) cassette splicing machines.

That drill got a bit expensive, so I started buying "E1 Cheapo" drugstore tapes (three C30's for $1.29) and discarding the tape from the housings. Works real neat. Now I record the desired number of programs or subroutines on my good C60 tape, run off another foot or so of tape, then clip the tape in the center of the middle opening (where the pressure pads are). Then I pull both ends of the tape out and splice the end coming from the takeup spool to the leader going to the supply spool of E1 Cheapo cassette (tape already discarded).

A pencil stuck in the hub of the supply spool will quickly rewind the tape into its new housing. At the end, cut the tape from the original leader, splice it onto the leader of the takeup spool of the new housing and reconnect the free end of the C60 tape to its takeup leader. You will eventually run out of takeup leader on your "good" tape, but what the heck - tape is cheap!

As an alternative, you can allow a foot or so of the beginning of the original tape to be used as a leader (mark it with a marker pen and don't start recording until this part is on the takeup spool). This way you can get amximum use from the good tape by sacrificing a foot of it to begin with. When you're through, you will have another empty cassette housing to use, with full length leaders.

CASSETTE DIRECTORY PRINTOUT PROGRAM

Chris McCormack
116 Milburn Lane
East Hills, NY 11577

...prints your tape directory on your TTY or terminal

This program is an expansion of the directory program, written by Jim Butterfield. The advantage of this program is that it will search a whole tape, and output the ID, starting address, and ending address of any program found. Because all of the branches are (EXC 0037) relative, the program is completely relocatable. Program start is at address 005F.

```
0000  D8           TOP     CLD
0001  A9 07                LDA #$07
0003  8D 42 17             STA SBD
0006  20 41 1A     SYN     JSR RDBIT
0009  46 F9                LSR INH
000B  05 F9                ORA INH
```

```
000D  85 F9           STA INH
000F  C9 16     TST   CMP #'SYN
0011  D0 F3           BNE SYN
0013  20 24 1A        JSR RDCHT
0016  C6 F9           DEC INH
0018  10 F5           BPL TST
001A  C9 2A           CMP #'*
001C  D0 F1           BNE TST
001E  A2 FD           LDX #$FD
0020  20 F3 19  RD    JSR RDBYT
0023  95 FC           STA POINTH+1,X
0025  E8              INX
0026  30 F8           BMI RD
0028  A2 02     MORE  LDX #$02
002A  20 24 1A  SECOND JSR RDCHT
002D  C9 2F           CMP #'/
002F  F0 09           BEQ OUT
0031  CA              DEX
0032  D0 F6           BNE SECOND
0034  20 EA 19        JSR INCVEB
0037  4C 28 00        JMP MORE
        (NOTE: MUST BE CHANGED IF RELOCATED)
003A  A5 F9     OUT   LDA INH
003C  20 3B 1E        JSR PRTBYT
003F  20 9E 1E        JSR OUTSP
0042  20 9E 1E        JSR OUTSP
0045  20 1E 1E        JSR PRTPNT
0048  18              CLC
0049  AD ED 17        LDA VEB+1
004C  65 FA           ADC POINTL
004E  85 FA           STA POINTL
0050  AD EE 17        LDA VEB+2
0053  65 FB           ADC POINTH
0055  85 FB           STA POINTH
0057  A9 2D           LDA #'-
0059  20 A0 1E        JSR OUTCH
005C  20 1E 1E        JSR PRTPNT
005F  20 2F 1E  START JSR CRLF
0062  20 32 19        JSR INTVEB
0065  18              CLC
0066  90 98           BCC TOP
```

ZIPTAPE CASSETTE INTERFACE (a review)

Wanna be able to load BASIC in 13 seconds? That's right - 13 seconds for an 8K load (about 12 times faster than HYPERTAPE).(600 bytes/sec).

As you can tell, I'm pretty enthusiastic about the cassette interface from Lew Edwards. So far, this system has proved 100% reliable at 4800 baud. I use a Sankyo ST-50 cassette recorder.

This interface consists of a 2"x2" p.c. board using a single IC (needs 5 v. @ 10 ma.) and 346 bytes of driver software. It uses 3 bits (PA0, PA1, and PA2) of KIM's I/O, and from $0200 to $02A8 and $0300 to $03B2 of KIM's memory.

The documentation, which includes a full source listing of the driver software as well as a schematic of the hardware, comes with enough information to enable the user to get this system running on ANY 6502 system that has 3 bits of a 6530, 6532, 6520 or 6522 available for use.

This system can be operated at 2400 or 3600 baud if your recorder can't handle the full 4800 baud speed.

For $26.50 you get an assembled interface board, a cassette of the software, and full documentation from Lew Edwards, 1451 Hamilton Ave., Trenton, N.J. 08629.

If you just can't swing a floppy-disc, Ziptape will ease the pain.

- ERIC

CASSETTE AVAILABILITY

Are you looking for some high-quality short and medium length cassettes? AB Computers (POB 104, Perkasie, PA 18944 (215)257-8195) has some which come in 5-screw housings and use AGFA tape.

We use these cassettes for software distribution here at USER NOTES and have been quite satisfied with them. Here's the price list:

C10 (5min/side)	10/$6.25
C30 (15min/side)	10/$8.00
plastic housings	10/$1.00

EDITORIAL (continued from inside the cover)

Things we'd like to know: What boards have you used successfully in the KIMSI? What mods did you have to perform to get other boards operational? Has anyone figured out a way of modifying the KIMSI so that the special I/O port of the memory map is moved down into KIMs' 4K "black hole" ($0400 $13FF)?

MANUFACTURERS

Need some ideas for new products? The 44 pin KIMBUS is gaining in popularity now that Rockwell and Synertek have entered the marketplace with products intended to be used with the KIM-4. There's always room in the RAM board market, how 'bout a low-cost dynamic RAM board which can take advantage of the super low-cost 4116 which are being offered for the TRS-80 and APPLE machines. I've seen a set of eight going for as low as $80.00. That's 16K!!! A good 64x16 or 80x24 video board is desperately needed.

How 'bout an EPROM board that can also program the 2708 or 2716. (At this point, the hobbyist is money ahead by sticking to the 2708, as low as $5.00, unless he really needs the single voltage of the Intel 2716.) A combination serial/parallel board using the 6522 and maybe the new Synertek 6551 ACIA would be very popular (2P+2S?).

BASIC INCOMPATIBILITY

Microsoft has written versions of BASIC to run on all major 6502 machines (KIM, APPLE, PET and OSI.) Although, for the most part, a program written for one machine can be run on another machine if they are typed in, a memory image cannot be transferred from one type of machine to another (PET to KIM, for example). The reason? First of all, when you type a BASIC program into your computer (with Microsoft BASIC, anyway) the program is compressed by changing BASIC commands into

CONTINUED ON NEXT PAGE

"tokens". For example, if you type in 100 PRINT "HI", BASIC would store two bytes for the address, and one byte for PRINT. "HI" would be stored without change. Using one byte "tokens" lets you get a larger BASIC program into smaller areas and could even help them run faster. Only one problem: Each different version of BASIC uses its own unique 'token' identifiers. (Does anyone know why this is so?)

The only way to transfer BASIC programs from one type of 6502 machine to another is to "LIST" the program out to the other computer. In other words, instead of listing the BASIC program to your printer, the output would be "vectored" to a new output routine which would talk to your object computer. The object computer would also be running BASIC and it would expect its "input" from the first computer instead of its own keyboard. Tricky, huh?

The PET, for example, is set up to list a program to a device on its IEEE bus so if I wanted to transfer some BASIC programs from the PET to the KIM, I would hook the KIM up to the PET's IEEE bus and "list" the program to the KIM. Don't forget, KIM needs to have BASIC running and modified so that its input comes from the IEEE bus so that its interface instead of the terminal.

Such a PET to KIM BASIC interface is on my list of projects so it may get done in my lifetime.

32K RAM FOR AROUND $200

Those of you that are running KIM-4, or compatible, motherboards will be happy to hear that I now have in my hot little hands an article on how to build a 32K dynamic RAM board using the 4116 devices which are being used to expand the APPLE computer. (You've seen them in all the mags for $80 - $100 per 16K.) The RAM card contains its own built-in, invisible refresh circuit and can be built on a 4.5x6 size Vector wire wrap card.

According to the author -"In eight months of constant use with a KIM-1 and KIM-4, no problems of any kind have been encountered with the unit. A second unit, built at the end of 1978, also works well."

Sorry, you'll have to wait for the next issue for this one.

announcements and reviews

PRODUCT ANNOUNCEMENT

Tiny Editor/Assembler and Robot

If you only have 4K of expansion and want to assemble programs, (once you start assembling your programs, you'll never go back to hand assembly!) You may want more info on this tiny editor/assembler package. The flyer didn't mention what type of I/O device was supported or where the package was assembled to operate from, but the ROBOT language supports the TVT-6 and needs RAM expansion starting from $0400 so the assembler requirements may be similar.

The single pass assembler overlays the editor in RAM and, except for the zero page references, seems to conform to the MOS definitions.

The price is $23.00 for the user manual, commented source listing ($20.00 without the cassette).

ROBOT is actually an interactive robot control language. The robot that is controlled is currently the cursor on the TVT-6 video board but it looks as if the user could modify this to control a "real" robot or a standard memory mapped video output device. ROBOT needs memory from $0200-$0540 and a TVT-6. I have this package and will be reassembling it to run an my system as soon as I get some time (fat chance!). This looks to be a very interesting package.

Several articles on an 8080 version have been published in Doctor Dobbs Journal.

ROBOT sells for $8.00 and includes a user manual, commented source listing and a cassette ($5.00 without the cassette). It's worth $5.00 just to see how it works!

Contact Michael Allen, 6025 Kimbark, Chicago Ill 60637.

PRODUCT REVIEW of the HDE DISC SYSTEM by the editor

A number of you have asked for details about the HDE full size disc system.

The system is based around the SYKES 8" drive with the 6502 based intelligent controller.

This drive is soft sectored, IBM compatible, and single density which lets you store about a quarter megabyte of data on a disc.

The system software, called FODS (File Oriented Disc System), manages sequential files on the disc much the same way files are written on magnetic tape - one after another. When a file is deleted, from a sequentially managed file system, the space that the file occupied is not immediately reallocated, as in some disc operating systems. As it turns out, this can be an advantage as well as a disadvantage since deleted files on the FODS system can be recovered after the file has been deleted. (This has saved my sanity more than once!) Of course when you want to recover some of the disc space taken up by a number of these deleted files, you can simply re-pack or compress the disc and all the active files will be shifted down until there are no deleted files hanging around using up space.

FODS has this ability to repack a disc.

When saving and loading in FODS you work with named files, not track and sector data or I.D. bytes. This makes life alot easier. I've seen some disc systems where you have to specify track and sector info and/or I.D. bytes. What a pain that can be!

If you just want to save a source file temporarily, you can do that on what's known as "scratch-pads". There are two of these on a disc, "scratch-pade A" and "scratch-pad B", each of these temporary disc files can hold up to 16K or if "B" is not used, "A" can hold one file up to 32K in length. The only files that can be temporarily saved on scratch pad are files that have been built using the system text editor.

Being a dyed in the wool assembly language programmer, I really appreciate the FODS text editor! This line oriented editor is upwards compatible with the MOS/ARESCO editor but includes about everything you could aske for in a line editor. There is a full and semi-automatic line numbering feature, lines can be edited while they are being entered or recalled and edited later, strings can be located and substituted, the line numbers can be resequenced, the file size can be found, the hex address of a line can be known and comments can be appended to an assembly file after it has been found correct. Oops! I forgot to say lines can also be moved around and deleted. This isn't the complete list of FODS editor commands, just the ones that immediately come to mind.

Another very powerful feature of the system is the ability to actually execute a file containing a string of commands. For example, the newsletter mailing list is now being stored on disc. When I want to make labels, I would normally have to load each letter file and run the labels printing program. But with FODS, I can build up a "JOB" file of commands and execute it.

HDE inc.

BOX 120
ALLAMUCHY, N.J. 07820
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HUDSON DIGITAL ELECTRONICS INC.

ANNOUNCING:

COMPUTER PROGRAMS FOR THE KIM-1

HDE ASSEMBLER

An advanced, two pass assembler using 6502 cross-assembler mnemonics. Free form, line oriented entry. Directives include: .OPTION, .BYTE, .WORD, .FILE, .OFFSET, .END. Output options include LIST, NOLIST, SYMBOL TABLE, NO SYMBOL TABLE, GENERATE, NOGENERATE, ERRORS, NOERRORS, TAB, NOTAB. Assemble using single or multiple files. Place source, object and symbol table anywhere in memory. Automatic paging, with header and page number. Approximately 4K. Loads at E000 or 2000.

HDE TEXT OUTPUT PROCESSING SYSTEM (TOPS)

A comprehensive output processor, including left, right and full justification, variable page length, page numbering (Arabic, capital and lower case Roman), page titling, leading and trailing edge tabbing, field sequence modification, selective repeat, selective page output, etc. More than 30 commands to format and control output of letters, documents, manuscripts and textual material of all types. Approximately 4K. Loads at E100 or 2100.

HDE DYNAMIC DEBUGGING TOOL (DDT)

Built-in assembler/disassembler coupled with single step and dynamic breakpoint entry/deletion facilitates rapid isolation, correlation and test of programs. Keystrokes minimized with single letter, unshifted commands, and optional arguments. Approximately 2K. Loads at E000 or 2000.

WATCH FOR PRODUCT ANNOUNCEMENTS THIS YEAR TO INCLUDE:

- Dual Channel RS-232 interface with auto answer
- Eprom card, eprom programmer
- NEC, Diablo printer interface.

All HDE memory and interface cards are KIM-4 compatible in a 4½" X 6½" format with on-board 5 volt regulation and address selection switches. Complex circuits are socketed for ease of maintenance. All products include a 90 day full parts and labor warranty, except memory boards which are 6 months, and computer programs which have a limited warranty.

ORDER DIRECT OR FROM THESE FINE DEALERS:

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